JOURNAL

OF THE

FRANKLIN INSTITUTE

OF THE

State of Pennsylvania,

DEVOTED TO THE

MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS

APRIL, 1834.

Contribution to the early History of Paper Making in the United States.

We have obtained from Mr. Isaac Sanderson, the present proprietor of the paper mill in Milton, Massachusetts, the following document, giving the origin and progress of the first paper mill established in Massachusetts, and should be pleased with corresponding contributions to the early history of this, or any other, branch of the mechanic arts, in our country.

COM. PUB.

Letter from Mr. JOHN BOIES, former proprietor of the Paper Mill in Milton, Massachusetts.

SIR,—In the office of the Secretary of the Commonwealth of Massachusetts, kept in the State House in Boston, in the court (legislative) record for 1730, page 154, is recorded an Act for the encouragement of the first paper mill, built in New England, passed September 13th, 1728, granting a patent unto Daniel Henchman, Gillam Phillips, Benjamin Faneuil, Thomas Hancock, and Henry Dering, for the sole manufacturing of paper for ten years, on the following conditions, viz.—

"In the first fifteen months, to make one hundred and forty reams of brown paper, and sixty reams of printing paper.

"The second year to make fifty reams of writing ditto, in addition to the first mentioned quantity.

"The third year, and afterwards yearly, to make twenty-five reams of a superior quality of writing paper, in addition to the former mentioned, the total annual produce of the various qualities, not to be less than 500 reams a year."

The act passed both houses, and was signed by William Burnett, Governor.

The aforementioned proprietors erected a small paper mill in Milton (now county of Norfolk,) on a site adjoining Neponset river, near the lower bridge, usually so called, where the salt water flows and stops it six hours out of every twenty-four. What number of years the original proprietors carried it on, is now not known; their master workman's name was Henry Woodman, an Englishman; he married in Milton, and left some children; two daughters, Abigail and Rebecca, I have often seen in the early part of my life.

The paper mill having been stopt for sometime, was eventually sold to Mr. Jeremiah Smith, who for want of workmen was prevented from making any use of it. In 1760 the business was again revived by James Boies, of Boston, he having procured a paper maker from a British regiment then stationed in Boston, by the name of Hazelton, who obtained a furlough long enough to set the mill to work. There was an American paper maker, Abijah Smith, then living in Milton, who assisted him; he was a decent workman, and continued at the business until an advanced age. On the regiment which Hazelton belonged to being ordered to Quebec, the Commander in Chief would not permit him to remain behind, and on the plains of Abraham, when the brave Wolf fell, he received a mortal wound, and died a few weeks after. A short interval then took place ere a Mr. Richard Clarke, an Englishman, arrived from New York, and again set the mill at work; he was undoubtedly, taking the whole together, better acquainted with the paper making business than any other European who had made his appearance here; he made most of the moulds he had occasion for. A few years after this, his son, George Clarke, aged about nineteen or twenty years, came to this country, who was also a clever man, and a good workman.

I have thus endeavoured to give you a general account of the commencement of our business, which I hope may afford you some satisfaction; there is no doubt but the paper mill first built in Milton, was previous to any other on this side of Philadelphia, if not the first in America, but that circumstance I presume you can easily ascertain by your connexion in that quarter.

Any thing further you may wish to know respecting this business, if in my power, you may freely command from

Your humble servant,

JOHN BOIES.

New method of Softening Cast Iron.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Having for the first time noticed an article under the above title, published in this Journal, No. 4. vol. iv, 1827, with the editor's re-

marks thereon, I am led to believe that less is known of the effects of alkali, applied to metals, particularly cast iron, in a heated state, than I had before supposed. The bottoms of pots used in making potash, and the ends of cast iron fire dogs, it is well known become very soft after having been some time in use. In 1824, I was well, and practically, acquainted with various methods of annealing, or softening hard cast iron, by the aid of brown sugar, soap, lime, &c., when it occurred to me to try common potash, which I did in the following manner:—The casting was a box for a mill gudgeon, weighing about six pounds, so very hard, that a good cast steel drill would have no effect upon it; it was heated in a common anthracite coal fire scarcely red, in which state it was bathed or washed with a strong solution of potash, when it was again placed in the fire, and allowed to remain till very hot, near fusion: it was then taken out and suffered to cool, after which not the least difficulty was experienced in drilling. This method of annealing, or softening, cast iron, I have seen successfully practised at the B. I. Cos. Works, for eight years, on castings of from 1 to a 100 lbs. and in every variety of shape. It is sometimes found necessary to repeat the operation when the casting is thick, and required to be softened quite through.

I have observed that chilled iron, that is, iron cast in metallic moulds, and consequently extremely hard and brittle, is much more readily and effectually softened than iron cast in sand, the cause of which I cannot satisfactorily explain.

Yours respectfully,
P. M.

Philadelphia, March 12, 1834.

An account of some Experiments made with Mr. Jos. Saxton's Electro-Magnetic Machine. By Jacob Green, *M. D., Prof. of Chem. in Jefferson Medical College.*

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Since the publication of Mr. Saxton's electro-magnetic machine, contained in the last number of the Journal, Mr. Isaiah Lukens, with his usual ingenuity, has converted the immense artificial magnet belonging to the Philadelphia Museum, into an apparatus for producing electrical currents. This magnet, it is well known, will permanently support a weight of about 134 pounds.* The length of the copper wire covered with silk, which surrounds the keeper, or armature, is 400 feet. It was expected that by thus increasing the size and magnetic power of the apparatus, that corresponding electrical effects would be produced, but except in two or three experiments, they

* *Description of the Magnet in the Philadelphia Museum.*—It consists of fifteen bars, weighing fifty-three pounds, which required, on the first trial, 310 pounds weight to overcome the attractive force. Its permanent power is 134 pounds, and it now supports a weight of eighty-four pounds.
October, 1825. F. Peale.

were nearly the same as those exhibited by a much smaller instrument in my possession.

The following experiments, made with the large apparatus in the Philadelphia Museum, will no doubt be interesting to those who are curious on this subject; they were made in conjunction with Mr. Titian R. Peale, to whose kindness and skill they are chiefly to be ascribed.

The Spark.—The appearance of the spark, when the keeper revolves in mercury, is very much like the spark produced by the rotation of copper wheels in that liquid, when under the influence of an ordinary electro-magnetic current; it is perhaps brighter, and when reflected from white surfaces, strikingly resembles the corruscations of the aurora borealis. When reflected from pale blue or pale green surfaces, its colour is not at all changed. In my small machine, which is very active, the spark only appears at the moment the *cross bar* leaves the mercury, but in the large apparatus it is seen both at the *wheel* and at the cross bar.

Fusion of Metals.—When the communication between the cross bar and the wheel is made by other metals besides quicksilver, small portions of the metals appear to be fused. In order to produce these effects, a thin flat piece of the metal, about an inch broad, and rounded at the ends, must be bent in the form of an arc, and applied to the cross bar and the wheel as they revolve; the little basin of mercury being previously removed. When a strip of *lead* is used, small bluish spots of light are produced. *Zinc* occasioned a spark very much like that from the lead. When a *copper* arc was used, the light was coloured, but whether it was green, as we expected, could not be satisfactorily determined. The light from *silver* differed but little from that produced by zinc. A strip of *artificial silver* (copper and nickel) had the same effect. A piece of *tin*, or tinned iron, gave out pencils of a beautiful variegated light. With a piece of *steel*, the experiment was striking in a high degree; flashes, corruscations, and sparks, were thrown off brilliantly in every direction, not unlike the combustion of a steel wire in oxygen gas.

It is a little remarkable, that broad flat surfaces must be used in these experiments, for when blunt points form the connexions there is scarcely any light whatever produced.

Effect on Inflammable Bodies.—A jet of hydrogen gas was thrown for some time on the spark produced when the cross bar left the mercury, when that liquid was used to form the communication, but it could not be ignited. Strong ether, which is so easily inflamed by a small electrical spark, was then poured on the surface of the mercury in the little basin, and a spark was thus made to pass through it, but no combustion ensued. The power of the instrument was, however, very much impaired, as long as the ether remained on the surface of the mercury.

Decomposition of Water, &c.—All our attempts to decompose water have entirely failed. We used an instrument similar to the one described by Mr. Saxton, at page 156, but not a bubble of gas could be observed. Besides pure water we used several saline solutions,

which are better electrical conductors, but with the same results. We expected to revive the metal on one of the platinum wires when a solution of the acetate of lead filled the tubes, but we were disappointed. Supposing that points did not discharge the *fluid* as well as surfaces, we introduced into the decomposing tube strips of silver, but without effect. Perfect contact between the wires from the tube and the wheel and cross bar, was particularly attended to, besides other means resorted to, a septum, or division was made at the suggestion of Mr. Lukens, in the little basin which contained the mercury, so that the wheel revolved in one half of the mercury, and the cross bar in the other, without communicating with each other—the amalgamated wires from the tube being also in different parts of the basin; but still no visible effect was produced on the liquids in the tube.

The Shock.—When two wires are pointed at the ends, and one end of each applied to the upper and under surface of the tongue, the opposite extremities being in contact with the cross bar and wheel, a very feeble shock is felt; but when the arrangement was made in the manner described by Mr. Saxton, at page 156, a powerful shock was experienced, passing through the tongue from one plate to the other. If, while the insulated plates in the above experiments are applied to the tongue, the upper lip be made to touch the upper plate, the muscles of the upper part of the face will then be slightly convulsed—the usual shock being at the same time produced. If one of the plates, or disks, be applied to the tongue, when the other disk is inserted between the upper jaw and the cheek, a convulsive motion will then be produced in the muscles of the mouth, accompanied by an acid taste, and at the same time a flash of light, as in the common experiment with the zinc and silver plates. From these experiments it is highly probable, that this instrument may be advantageously used, in certain cases of disease, instead of the common electrical apparatus.

Effect on the Galvanometer and Electrometer.—With my small machine, made by Mr. Lukens on the plan described at page 155, the needle of the electro magnetic multiplier was made to place itself at right angles to the magnetic meridian, and by a little management a rapid rotation of the needle was produced. With the common electrometer no divergency of the leaves could be effected either with the small or the large apparatus. We were so confident of success in this experiment that it was not until all conceivable devices for the purpose had been resorted to in vain, that we gave it up as hopeless. Thus two strips of gold leaf were attached, one to each plate of the apparatus for producing shocks; then a single piece of gold, enclosed in a glass case with a solid strip of silver; these with several other arrangements, were all ineffectual.

Effects by Induction.—We succeeded in rendering a curved bar of soft iron magnetic, by wrapping, in the usual way, a copper wire, covered with silk, many times round it, and these connecting the extremities of the wire with the cross bar and wheel. The curved bar then acted as a horse-shoe magnet, attracting by its inductive force,

light ferruginous substances. The quantity of iron lifted was by no means as great as was expected. The power of magnetic induction in an electro-magnet is supposed to be in proportion to the *heat* produced in the wire: if that be true, it may account for its feeble manifestation in the above experiment. When a helix of copper wire, through which the electrical current was made to circulate, surrounded a straight bar of soft iron, the helix not being in contact with the bar, no induced magnetism could be detected.

In the ordinary construction of Mr. Saxton's magnetic machine, the mercury in the little basin forms the communication between the cross bar and the wheel. In my small apparatus, I removed the mercury, and endeavoured to form the connection between the bar and the wheel, by filling the basin with a number of saline solutions, but no effects were produced. The only advantageous change in the original form of the instrument, which we would suggest, is when exhibiting the *sparks*, to remove the basin of mercury, and to supply its place by an arc of steel, a circular piece of copper being then substituted for the cross bar. The details, in arranging this little contrivance, are so obvious as to need no further description.

We are fully satisfied, that the maximum power of the large machine in the Philadelphia Museum, has not been developed by its present arrangement. It is proposed, therefore, to alter its form, in some respects, when further experimens will be made upon it.

Description of a New Form of the Stomach Pump. *By* P. B. Goddard, *M. D., of Philadelphia.*

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

This pump consists of two parts, one of which I shall call the valve box, the other is an ordinary syringe, of good construction, to which the valve box is screwed when in use.

The valve box is a cylinder of metal, containing ovoidal or egg-shaped cavities, equally distant from the centre of the cylinder; at this point a pipe enters, which, when screwed on to the syringe, opens a communication between its cavity and these two cavities in the valve box. Near each end of the cylinder, a short and slightly conical tube projects laterally, to which a flexible tube is to be fastened, and which causes a communication between the flexible tube and the cavity in the valve box. Each of these cavities contain a bullet accurately turned, so as to fit the orifices of the tubes, entering into it, and acting as a valve. It will be seen by reference to the accompanying cut (which is a section of the valve box) that if the valve box be held vertically, and the syringe screwed on to it, the bullet in the upper cavity will fall upon the orifice of communication between it and the body of the syringe, whilst the bullet in the lower cavity, will in like manner lie upon the orifice of the tube leading externally. If the lower tube be now immersed in water, and the piston of the syringe be drawn out, it will be evident that the body of the syringe will be

filled with water from the lower tube. If now the piston be pressed home, the water will pass out of the upper tube; the bullet in the lower cavity preventing its escape there, just as the bullet in the upper one prevented the entrance of air before. It will then always pump water, or any other fluid, from the lower tube to the upper.

If the position of the valve box be now reversed, and the end which was above be placed below, the bullets will fall by their own gravity into the opposite ends of the cavities, and the instrument will act as it did before, viz. pumping from the lower orifice to the upper, although the relative position of the tubes has been reversed.

To use this instrument, the valve box must be held in nearly a vertical direction. A long flexible tube being passed into the stomach, is attached to one of the short conical tubes, say the upper, and a short tube leading to a basin is then fastened to the lower one. The basin being filled with warm water, and the syringe put in action, the water will pass into the stomach and dilute the poison. When enough has passed in, the syringe is to be turned in the hand, so as to bring the tube down which was before above, without taking off the flexible tubes, or changing them in any way, and the syringe again put into action. The water will be pumped out of the stomach bringing the poison along with it.

The following are the chief advantages of this instrument. It is perfectly simple in its construction, and not liable to get out of order.

The directions for its use are easily understood, and as easily remembered.

After the flexible tubes are once adjusted, no alteration is required until the operation is finished.

When the instrument is once put in action, gallons of water may in a few minutes be passed through the stomach, thus washing away every trace of poison, and saving many a valuable life.

Explanation of the cuts.

Fig. 1.

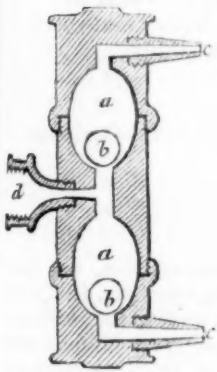

Fig. 1, section of valve box.
a a, cavities for the bullets.
b b, bullet valves.
c c, tubes, to which are attached the flexible pipes.
d, female screw to attach it to the syringe.

Fig. 2.

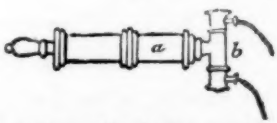

Fig. 2, the entire instrument.
a, the syringe.
b, the valve box.

FRANKLIN INSTITUTE.

Annual Meeting.

The annual meeting of the Institute was held at their Hall, on Thursday evening, January 16th, 1834.

Mr. C. C. Haven, was appointed chairman.

The chairman of the Board of Managers presented the Annual report, which was read and ordered to be published.

The resolutions recommended by the Board, establishing the committee on Science and the Arts, were adopted.

The tellers reported the result of the annual election for officers and managers for the ensuing year, from which it appeared that the following gentlemen were duly elected, viz:

James Ronaldson, President.

Isaiah Lukens, Thomas Fletcher, } Vice Presidents.

William S. Perot, Recording Secretary.

Isaac Hays, M. D. Corresponding Secretary.

Frederick Fraley, Treasurer.

Managers.

Samuel V. Merrick	J. Henry Bulkley
Abraham Miller	Alexander Ferguson
William H. Keating	Joshua G. Harker
Isaac B. Garrigues	John Agnew
Rufus Tyler	John Wiegand
John Struthers	William B. Reed
Matthias W. Baldwin	George Fox
Mordecai D. Lewis	Alexander M'Clurg
Charles H. White	* Robert Lindsay
Thomas Scattergood	* Joseph S. Walter jr.
Benjamin Reeves	* John A. C. Trautwine
Alex. Dallas Bache	* Samuel Hufty

* New members.

(Extract from the minutes.)

C. C. Haven, Chairman.

William S. Perot, Recording Secretary.

Monthly Meeting.

A Monthly Meeting of the Institute, for conversation, was held at the Hall of the Institute February 27th, 1834, when Mr. R. Cornelius showed a model of a lamp with a constant level in the surface of the oil. The light was beautifully clear and continued undiminished at the close of the evening. The principles of the lamp were ex-

plained. It is expected that a drawing and description will be furnished for publication in this Journal.

A large revolving keeper magnet, on Saxton's plan, belonging to Mr. T. R. Peale, was exhibited; the spark was shown by it, and also the scintellations from surfaces of steel and of copper. Critical remarks were made on the experiments, and on the construction of the apparatus.

Mr. S. C. Walker showed a pocket chronograph, by Fatton. The principle of this instrument is the same as of that exhibited at a former meeting, and noticed on the minutes. The watch form renders it more portable.

Messrs Bache and Tyler, from the committee on explosions, showed, in a modified form, the experiment of Perkins in relation to the inability of water to pass through small openings in a highly heated metallic vessel.

A fine suite of casts, in plaster, of medals, &c. was placed upon the table. The specimens were the work of an Italian artist, J. Berzanti, now residing in this city. They excited much attention, being deemed the best specimen of the art yet executed in our country.

Minutes of the Board of Managers.

At a Meeting of the Board of Managers, held January 18,

Mr. Alexander Ferguson, was elected Chairman of the Board, and

Messrs. M. W. Baldwin and Frederick Fraley, Curators for the ensuing year.

And at a meeting of the Board held January 25th, the chairman nominated the standing committees agreeably to the bye-laws. On motion, Mr. Alexander Ferguson was added to the committee on premiums and exhibitions, and to the managers of the sinking fund; and Mr. Jacob Pierce to the committee on the cabinet of minerals; when the committees were appointed as follows:—

On the Library.

Mordecai D. Lewis	William S. Perot
Isaac Hays, M. D.	George Fox
William B. Reed	Robert Lindsay

On the Cabinet of Models.

John Agnew	John Wiegand
Benjamin Reeves	Charles H. White
John Struthers	Joseph S. Walter, jr.

On the Cabinet of Minerals.

Isaiah Lukens	John A. C. Trautwine
Abraham Miller	Samuel Hufty
William H. Keating	Jacob Pierce
Thomas Scattergood	

On Publications.

Alex. Dallas Bache	Matthias W. Baldwin
Isaac Hays, M. D.	Rufus Tyler
Samuel V. Merrick	

On Premiums and Exhibitions.

Samuel V. Merrick	J. Henry Bulkley
Joshua G. Harker	Isaac B. Garrigues
William H. Keating	Alexander M'Clurg
Isaiah Lukens	Alexander Ferguson

On Instruction.

Frederick Fraley	Charles H. White
M. W. Baldwin	John Wiegand
Rufus Tyler	John A. C. Trautwine

On Monthly Meetings.

Alex. Dallas Bache	Rufus Tyler
Samuel V. Merrick	Benjamin Reeves
Isaac Hays, M. D.	

Managers of the Sinking Fund.

Samuel V. Merrick	Alexander Ferguson
Frederick Fraley	

Auditors.

Isaac B. Garrigues	Joshua G. Harker

(Extract from the minutes.)

ALEXANDER FERGUSON, Chairman.

WILLIAM HAMILTON, Actuary.

Annual Report of the Board of Managers.

To the Franklin Institute of the State of Pennsylvania, for the Promotion of the Mechanic Arts, the Board of Managers respectfully submit their tenth Annual Report:—

The condition of the institution, which it is made, by the constitution, the duty of the Managers at this time to report to the members of the Institute, is one well deserving mutual congratulation. From a small beginning, in an attempt to diffuse useful knowledge, to promote practical science and the mechanic arts, the institution has grown to be respected by her members and the public, and to feel that her efforts have been crowned with a success, which stimulates to new exertion.

The growing taste for science, fostered by the lectures of the Institute, manifests itself in the most unequivocal manner, by the num-

bers of the class which throng the lecture room, the accommodations of which it has been necessary to extend by every device which the capacity of the room will permit. To the lecturers who have, by the accumulated labours of past years and of the present one, brought about such a result, the thanks of the Institute are due, and are given as freely as the instruction has been communicated. The course of chemistry, by Professor J. K. Mitchell, which gave such general satisfaction during the last year, has had new and appropriate interest infused into it during the present. The division of the courses of natural philosophy from that on mechanics, has permitted the lecturer, Professor W. R. Johnson, to present to the class new matter for consideration, of a popular as well as of a practical kind. To Gouverneur Emerson, M. D., who has for the second time come forward with a course on meteorology, and to J. Millington, Esq. late Professor of Natural Philosophy in the Royal Institution of London, who is engaged in a most able series of lectures to the class on astronomy, the Managers thus publicly tender their thanks. By the aid of these gentlemen the class is provided regularly with three lectures during each week.

With a view to the promotion of an interesting branch of science, geology, the Board of Managers have granted the use of their lecture room to Henry D. Rogers, Esq., late Professor of Chemistry in Dickinson College, for the purpose of delivering a course of lectures on that subject. To these lectures members of the Institute are admitted on a very favourable footing.

The arrangements made in the other branches of instruction should secure for them the warm support of the members of the Institute. The committee on instruction have placed the drawing school under the charge of Mr. William Mason, whose abilities as a teacher in that branch are extensively known. The accommodations of the school, were last year increased, by allotting to it the front room on the third floor of the hall, and an excellent and efficient discipline combined with thorough instruction, render it in every respect deserving the patronage of the mechanic. The English school under the charge of Mr. Seth Smith is no less efficient, and it is believed by the Board that strict inquiry into the items of expenditure will satisfy the members that the tuition fee fixed in this school is in reality not higher than a much less nominal sum might prove when added to incidental expenses, which are here not liable to be charged.

As subsidiary to the instructions of the lecture room should be noticed those opportunities afforded for the acquirement of information, by the library and reading room, and for mutual instruction, by the monthly meetings for conversation on mechanical and general science. During the year, the committee on the library have added to the limited number of works now in our possession whenever the funds at their disposal would permit. Donations have been received from many public spirited individuals among our members, in the foremost rank of whom by the number of their donations ought to be stated the names of the enterprising publishers Messrs. Carey, Lea & Blanchard. The donations received with the names of the donors

attached, have been regularly placed upon the shelves by the committee, whose duties have been further pursued by the preparation of a catalogue of the library, which is now nearly completed.

The monthly meetings for conversation have proved highly acceptable to the members; the absence of form, and the considerable variety introduced in them, have led to a regular increase in the attendance upon them: their organization requires only to be a little better understood to enable each one present to attend in succession to every one of the objects which may be, in the course of discussion, submitted for examination.

As contributing to sustain the spirit of scientific inquiry, the Journal of the Franklin Institute should be noticed in connexion with the foregoing subjects. Published in monthly numbers, furnished at a reasonable price, and in both matter and manner worthy of the institution from which it emanates, this Journal is winning its way into extended notice. Every member of the Institute, whose means are in any way adequate to it, should be a subscriber, recollecting that an increased subscription will enable its conductors to add to its efficiency, and will relieve the institution from any charge concerning it. The volumes for the past year have contained 872 pages, of which 495 pages have been of original matter. The labours of the editor may well be classed, as they have just been, with original matter, including as they do the reasoned abstract of manuscript descriptions, with remarks which the experience of Dr. Jones renders particularly valuable. Sixty-eight periodicals, foreign and domestic, and newspapers, received in exchange for the Journal, are placed at the disposal of the committee in the library for the reading room by the committee on publications.

Of the contributions to practical science, the experiments on water wheels, first undertaken, have been laid before the public, but the report is yet incomplete. The investigations on the explosion of steam boilers, will soon be submitted to the Treasury Department of the United States, under the direction of which the experiments have been made, and to the public through our Journal. The public mind has been, by a course of melancholy accidents, but too well prepared for the reception of a report on this subject. The branch of this inquiry relating to the strength of iron and copper, has been nearly brought to a close. It has already been reported to the Institute, that at the last session of the Legislature of our state, the Secretary of the Commonwealth was instructed by the House of Representatives to refer to the Managers of the Franklin Institute a bill relating to weights and measures, and to admeasurement. The committee appointed to consider this subject, have obtained from their members an abstract of the proceedings in England and France, and of the reports upon the same subject in our own country; these documents, as furnishing valuable matter for the understanding of the subject, will be at once submitted through the pages of the Journal. The committee have reported in part to the managers, and have stated that their labours will require but a few weeks to bring them to a close.

Among the acquisitions made during the year, the collections in natural history, belonging to the Maclurean Lyceum, have already been noticed. The minerals of this collection are in the hands of the committee on minerals, who have been engaged in arranging them. The other property will be exchanged for articles more immediately within the scope of this institution.

The model room on the third floor of the Hall, has been put in complete order by the committee on models. The Managers again call the attention of the members to the propriety of making this room a depository for specimens of mechanical skill, the ground work of a museum of practical science.

The success of the exhibition of domestic manufactures held in October last, has been alluded to in the last quarterly report. Since that time, the detailed report of the committee on premiums and exhibitions, has been received, and published in our journal. The premiums and certificates of honorary mention awarded to successful competitors at the exhibition, were publicly presented by the President of the Institute in the Society's Hall. Domestic occurrences led to the disappointment of the Managers and of the Institute in the delivery of the public address which was expected from the Hon. Daniel Webster, of Massachusetts. The number of premiums awarded at the last exhibition was thirty-three, and of certificates of honorary mention forty-eight; a reference to the list will show that the committee have been true to their trust in excluding from their awards the influence of local or sectional feeling. The premium for an improved lamp for lighting our streets, which the committee were enabled to offer through the liberality of the councils, has not yet been awarded. The duties of the committee on inventions have rather increased during the past year, and they deserve the thanks of the Board for the regularity with which they have discharged them. They have had before them thirty-four inventions, either for advice, for decision upon them, or for report. One branch of their duties is yet incomplete, namely, the reference to them of the decision as to the successful competitor for the premium for stopping the sparks which issue from the chimnies of locomotive engines, where wood is used for fuel. The committee have examined the different models which have been submitted to them, and have selected for trial those which they have deemed most likely to be successful; they have further applied to the Philadelphia and Germantown Rail-road Company for permission to make the necessary trials upon their road. In order to remove any source of complaint in relation to their selection of machines for trial, they have informed all the inventors who have offered models for examination, that they will, if furnished with the machine at the expense of the inventors, make trial of it.

Fully convinced of the benefits which have already accrued to the community from the labours of this Institute, in disseminating information and a spirit of inquiry among the mechanics, your Board have sought means by which such usefulness may be increased.

Hitherto, with some exceptions well known to you, the labours of the Institute have been directed principally to the instruction of its

members, while the community has not in turn been benefitted by the members to the extent which the amount of talent and information possessed by them would warrant the public in expecting. This defect may be attributed rather to want of opportunity than to want of inclination. By our present organization all labours calculated to increase the usefulness of the institution, are devolved upon its managers, and a few others who have shown zeal in its behalf, while the mass of its members retire from labour, probably because they have not been made to feel how useful their exertions may be to the public and to themselves.

An experience of ten years has fully tested the wisdom of the organization of the Institute; and as far as regards its fiscal concerns and its economy as a body politic; the organization could not, probably, be improved. Your Board are of opinion that such is not the case with the arrangement for the scientific labours of the institution, which can only be benefitted by the co-operation of those whom education, business in life, and habits, render peculiarly qualified for the task. Your Board, in conformity with these views, would ask your consideration of the resolutions that accompany this report; the object of which is, to unite the efforts of those members who may be able and willing to take charge of the scientific duties of the Institute.

They propose for this purpose, to create a committee to be called the Committee on Science and the Arts. This committee to be composed of all members who will voluntarily enrol their names and engage to give their services. This enrolment being merely intended as a pledge that the members of the committee stand ready, when called upon to render such services as the Institute may require, and which they may be competent to render. The services required will be to take part in committees upon subjects connected with physical science, to examine new machines or other inventions, to discuss such subjects as may be deemed of interest, in the pages of the Journal, and in general such labours as may tend to the dissemination of information connected with science and the arts.

It is believed that there are many of our younger fellow members, who having been during years past in attendance upon the lectures and schools of the Institute, are now ready to repay with interest from their acquired stock of knowledge, the benefits which they may have received. These members will, by the plan now submitted, be made known to the society, and the benefits of their exertions gained to the institution.

The Board conclude their report by an exhibit of the number of members of the Institute, and of the finances.

On the first of January, 1833, there were attached to the institution 1422 members; during the year there have been added 290 members, and fifty-three have resigned, or are deceased. The present number is 1659, of whom 137 are life members.

During the present quarter, Messrs. Geo. Jones, Jas. Magee, W. H. Ellis, and Isaac B. Garrigues, have become life members.

The treasurer's report, herewith submitted, shows a balance in his hands of $1049 56.

ALEX. DALLAS BACHE, *Chairman.*

WM. HAMILTON, *Actuary*

Resolutions recommended by the Board and adopted by the Institute.

Resolved, That the Board do recommend to the Institute, at their annual meeting, the passage of the following resolutions—

I. Resolved, That the committee on inventions, heretofore appointed by the Board of Managers, shall be extended under the title of the "Committee on Science and the Arts," and that the number composing said committee shall hereafter be unlimited.

II. Resolved, That the "Committee on Science and the Arts," shall consist of such members of the Institute as shall voluntarily enrol their names as members thereof, in a book to be prepared for the purpose, and who will, by enroling their names, pledge themselves to perform such duties, to be hereinafter described, as may devolve upon them, and to sustain by their labours the scientific character of the Institute.

1. It shall be the duty of that committee to hold periodical meetings at the Hall of the Institute, at such times as they may deem expedient, to enact rules for their own regulation, and to appoint a member to preside over their deliberations.

2. It shall be the duty of said committee to examine either as a body, or by sub-committees, all inventions that may be submitted, and to make detailed, descriptive reports thereon, giving their opinion with candour and impartiality on the inventions submitted, in the manner now practised by the committee of inventions.

3. It shall be the duty of that committee, to conduct by sub-committee, or otherwise, such scientific investigations as may be deemed worthy of consideration, and to publish the results in the Journal of the Institute.

4. It shall be the duty of that committee, by sub-committee or otherwise, to inquire and report into the state of the arts generally, or into the state of any branch thereof, when called upon to do so, in order to disseminate useful practical information, or historical facts in relation thereto.

5. To that committee shall be confided, in general, the scientific duties which devolve upon the institution, tending to mutual instruction, and to the dissemination of knowledge, and which are not specially intrusted by the constitution to the officers of the Institute.

III. Resolved, That the said committee shall be governed in the expenditure of money by the same rules as govern all other standing committees, and it shall not be competent to them to contract any debts, until they shall have been authorized by an appropriation made by the Board of Managers, upon the requisition of the committee.

IV. Resolved, That it shall be the duty of the chairman of the "Committee on Science and the Arts," to report the proceedings of the committee to the Board of Managers, at least three weeks previous

to each quarterly meeting of the Institute, in order that the information therein contained, may be included in the quarterly report; and to report to the Institute whenever directed so to do.

V. Resolved, That the chairman of the committee shall be elected annually, at the first meeting after the annual meeting of the Institute.

REPORT OF THE COMMITTEE ON WEIGHTS AND MEASURES.

Appendix to the Report of the Committee of the Franklin Institute on Weights and Measures.

Abstract of the reports on Weights and Measures which have been submitted to the Congress of the United States, or to the Legislature of Pennsylvania. By A. D. BACHE, *Professor of Natural Philosophy and Chemistry in the University of Pennsylvania.*

To the Committee of the Franklin Institute on Weights and Measures.

GENTLEMEN,—

The portion of duty which you have assigned to me is to give an outline of the different reports on weights and measures made in our country since the period of our national independence. You are aware that this subject has occupied the attention of Congress at different times; that in some of the states the legislatures have been but little less earnest in seeking for information; and that in one, at least, the legislature has been prompt in acting upon it when obtained.

Our national councils have had the advantage of reports from two of our most eminent statesmen, the one in the earlier periods of our national existence, before the systems of weights and measures adopted by England and France had been fairly ushered into being, the other at a later period, when the full operation of the emphatically modern system adopted by France had been tested by experience. Congress have further had before them one of the best practical examinations of the subject which modern science has produced. A sister state has, under the guidance of an eminent citizen, arranged a system remarkable for its simplicity, and resting upon a scientific basis, which should insure its permanence.

The reports in relation to weights and measures in our country which I have been able to examine, are

I. A Report by Thomas Jefferson, Secretary of State, to the Congress of the United States, dated July 4, 1790.

II. The Report of a Committee of Congress, dated January 25th, 1819.

III. The Report of John Q. Adams, Secretary of State, to the Congress of the United States, dated February 22, 1821.

IV. A Report of the Secretary of the Treasury, Louis M'Lane, to the Senate of the United States, inclosing the reports of F. R. Hassler, Esq. to the Treasury Department. 1833.

V. The Report of a Committee of the Senate of Pennsylvania, Mr. Dorsey, Chairman, made in March, 1808.

VI. The Report of a Committee of the same body, Condie Raguet, Esq. Chairman, made in March, 1822.

VII. A Report by Professor James Renwick, of Columbia College, New York, to the commissioners for revising the laws of the state of New York, 1826.

I.—1. The period at which the report of Mr. Jefferson was written, was that just preceding the organization of their new system, by the French republic, and just subsequent to the proposition for reform in the existing usages, made by the Bishop of Autun to the national assembly. Mr. Jefferson sketches two systems of weights and measures, the one conforming as nearly as possible to the existing state of things, aiming only at introducing greater uniformity, the other a decimal system, retaining, however, certain names of common use, whenever the new weight or measure approximates in value to the old. The common natural basis of each system was the standard of length derived from the pendulum, but in a particular way; the pendulum proposed was a cylindric rod, and the whole length of the rod taken, instead of the length of the equivalent simple pendulum. It is unnecessary at this time to discuss the reasons why the advantages which this eminent philosopher supposed would be realized by such an arrangement, would not have existed in practice, since the system at last connects itself with, and may be considered as based upon, the length of the pendulum. The second, or decimal system, was suggested on the event of its being supposed that the people of the United States should be willing to adopt in their weights and measures, as they had done in their coin, an entirely new division. The adjustments of the first system, which Mr. Jefferson obviously views as most practicable, were as follows:—

2. The pendulum, in latitude 45°, at the level of the sea, and at some standard temperature and pressure, to be the basis of the system, and the unit of length (the foot) to bear a certain determinate ratio to this length; the determination to be made upon existing *English* standards.

3. The unit of capacity to be derived from that of length, by cubing; but one set of measures of capacity for both liquid and dry substances to be used, the unit (the gallon) to contain 270 standard cubic inches, at the rate of 12 inches to the standard linear foot.

4. The unit of weight, the ounce, to be derived from that of capacity by the weight of water which a cubic foot will contain; this being declared to weigh 1000 standard ounces, at some determined temperature and pressure. But one set of weights to be allowed, and that a sort of compromise between the troy and avoirdupois tables, founded on the fact that the avoirdupois subdivisions of the ounce, and the troy multiples of the ounce, are not in common and extended use. The tables of weights and measures proposed, are as follows:—

MEASURES.

Linear Measure, based upon the foot obtained as before stated.

10 lines	= 1 inch.	
12 inches	= 1 foot.	*Standard.*
3 feet	= 1 yard.	
3 ft. 9 ins.	= 1 ell.	
6 feet	= 1 fathom.	
5½ yards	= 1 pole or perch.	
40 perches	= 1 furlong.	
8 furlongs	= 1 mile.	
3 miles	= 1 league.	

Superficial Measure.

40 sq. perches	= 1 rood.
4 roods	= 1 acre.

Measures of Capacity, based upon the gallon of 270 cubic inches.

4 gills	= 1 pint.	
2 pints	= 1 quart.	
2 quarts	= 1 pottle.	
2 pottles	= 1 gallon.	*Stand'd.*
2 gallons	= 1 peck.	
8 gallons	= 1 bushel or firkin.	
2 bushels	= 1 rundlet, kilderkin, or strike.	
2 kilderkins	= 1 barrel. or comb.	
2 barrels	= 1 hogshead, or quarter.	
1⅓ hogshead	= 1 tierce.	
2 hogsheads	= 1 pipe, butt, or puncheon.	
2 pipes	= 1 ton.	

WEIGHTS.

Standard, the ounce. 1000 oz. being the weight of a cubic foot of rain water.

24 grains	= 1 pennyweight.	
18 pennyweights	= 1 ounce.	*Standard.*
16 ounces	= 1 pound.	

The pound contains 6912 grs.

5. This report was followed by that of a committee of the Senate, in 1793, to which I have not been able to obtain access.

II.—6. The next reference to this question, in our national councils, was a report by a committee, bearing date January 25th, 1819. The committee express their decided opinion, that, in the circumstances of our country, the best course is to adopt absolute standards conforming to the weights and measures in common use. They propose, therefore, that there should be obtained by a commissioner to be appointed for the purpose, models of the yard, the bushel, the wine gallon, and the pound, supposed to conform to those in most common use in the United States. Measures are then proposed for the preservation of the standards, and for the distribution of copies throughout the several states. The committee further recommend, that to provide against the loss of these standards, the yard be compared in length with the seconds pendulum, and with an arc of a terrestrial meridian; that the relation in weight of the pound to the weight of a determined bulk of pure water be ascertained, and that the bushel and gallon be defined by the weight of water which they will con-

tain. There is a vagueness in the propositions, resulting from the fact that much is left to the commission to determine, and the proposed legislation would have been of a provisional character.

III.—7. The report of the then Secretary of State, John Q. Adams, was drawn up in 1821, in conformity to a resolution of the Senate of the United States, adopted in March, 1817; by this resolution the Secretary of State was requested to prepare and report to the Senate "a statement relative to the regulations and standards for weights and measures in the several states, and relative to proceedings in foreign countries, for establishing uniformity in weights and measures, together with such propositions relative thereto, as may be proper to be adopted in the United States." The resolution embraces three distinct objects of inquiry. First. The regulations in relation to the same object in the several states. Second. The proceedings in foreign countries for establishing uniformity of weights and measures. Third. Propositions relating to the same point in the United States.

The course pursued by Mr. Adams in his general investigations is bold and ingenious, pursued more in the manner, and with the views, of a legislator, a statesman, and a lawyer, than of a mere man of science. Of this learned document, forming, as it does, a standard work of considerable bulk, it would be impossible to give an adequate idea by a simple analysis, but the parts bearing especially on the question before us, admit of a ready statement. He undertakes to show that identity of measures of length, of capacity, and of weights, for different articles, is not the natural system, and to trace the connexion of them with each other, and with the weight of coin, from the Hebrews and Egyptians, to the Greeks and Romans and, with modifications, through the complex, varying, and entangled system of the older English to the present standards. His investigations throw great light on the diversity of the English standards, and although the entire subject must claim notice from another source, and the errors in British legislation be presented to you from the same quarter, I have thought it best to exhibit, in the tabular form into which the results are thrown by Mr. Adams, the standards of measure as at different times arranged, with a view to the more proper understanding of the usages which prevail in the several states. [Note A.]

8. Mr. Adams next gives a sketch of the system of metrology (1793 to 1812) adopted by the French, in which not only the history of the system, but the various operations necessary to its completion are stated, the parts taken by the great men who figured in the work, are traced, and the difficulties of its introduction reasoned upon and illustrated; he indicates the attempt to evade the weight of popular prejudice, which impeded the system, by the restoration of old names for new things, and describes the ultimately legalized binary divisions which completed the overthrow of the decimal system. The warning thus conveyed, is accompanied by a statement that the old measures are not yet eradicated. This clear report is concluded by a comparison of the French and English systems, upon one point of which, as it

must claim particular notice from this committee, I must beg leave to offer a few remarks. [See note B.]

9. The conclusion to which this comparative, and, for the most part, practical, examination leads, is that "the time has not arrived at which so great and hazardous an experiment can be recommended, as that of discarding all our established existing weights and measures, to adopt and legalize those of France in their stead." And the opinion is based on the following reasons. "First that no change whatever of the system could be adopted, without losing the greatest of all the elements of uniformity, that referring to the persons using the same system. This uniformity we now possess, in common with the whole British nation; the nation with which, of all the nations of the earth, we have the most of that intercourse which requires the constant use of weights and measures. No change is believed possible other than that of the whole system, the benefit of which would compensate for the loss of this uniformity."

"Secondly, that the system, as it exists, has a uniformity of proportion very convenient and useful, which any alteration of it would disturb, and perhaps destroy; the proportion between the avoirdupois and troy weights, and that between the avoirdupois weight and the foot measure; one cubic foot containing of spring water exactly one thousand ounces avoirdupois, and one pound avoirdupois consisting of exactly seven thousand grains troy."

"Thirdly, that the experience of France has proved, that binary, ternary, duodecimal, and sexagesimal divisions, are as necessary to the practical use of weights and measures, as the decimal divisions are convenient for calculations resulting from them, and that no plan for introducing the latter can dispense with the continual use of the former."

"Fourthly, that the only *material* improvement, of which the present system is believed to be susceptible, would be the restoration of identity between weight and silver coin; a change, the advantages of which would be very great, but which could not be effected without a corresponding and almost total change in our coinage and monies of account; a change the more exceptionable, as our monetary system is itself a new, and has hitherto been a successful institution."

This is not the time for examining these positions particularly, but they should be before the committee as the strong grounds upon which the argument rests.

10. Mr. Adams urges upon Congress to communicate through the president with foreign governments, to introduce a union in a system of metrology, so as to produce a real uniformity throughout the principal nations of the world.

He next proceeds to a rapid view of the state of the standards in the mother country, immediately previous to the colonization of America, and then gives an outline of the enactments of the colonies, and states of our Union. This information, derived from authentic sources, the communications of the executive of the several states, will serve to give the committee a knowledge of the state of legislation up to the

time of Mr. Adams' report. I therefore append an abstract as far as relates to our present object. (Note C.)

11. The report under consideration is concluded by a review of the powers of Congress in relation to weights and measures, in which Mr. Adams obviously doubts their right to change* existing systems, and by a brief statement of the different modes of proceeding which are possible, and a recommendation of the last for present use, viz. "To adhere without any innovation whatever, to our existing weights and measures, merely fixing the standard."

To carry this object into effect, he considers that the act of Congress should embrace the following objects:

"1st. To *declare* what are the weights and measures to which the laws of the United States refer, as the legal weights and measures of the Union.

2. To procure positive standards of brass, copper, or such other material as may be deemed advisable, of the yard, bushel, wine and beer gallons, troy and avoirdupois weight; to be deposited in such public office at the seat of government as may be thought most suitable.

3. To furnish the executive authorities of every state and territory with exact duplicates of the national standards deposited at the seat of government.

4. To require, under suitable penal sanctions, that the weights and measures used at all the custom houses, and land surveys, and post offices, and, generally, by all officers under the authority of the United States, in the execution of their laws, should be conformable to the national standards.

5. To declare it penal to make or to use, with intent to defraud, any other weights and measures than such as shall be conformable to the standards."

The system which would thus be sanctioned would require the following provisions.

"For the purposes of the law it will be sufficient to declare that the English foot, being one-third part of the standard yard of 1601, in the exchequer of Great Britain, is the standard unit of the measures of the United States; that an inch is a twelfth part of this foot, that thirty-two cubic feet of spring water,† at the temperature of 56 degrees Fahrenheit's thermometer, constitute the ton weight, of 2000 pounds avoirdupois; that the gross hundred of avoirdupois weight consists of 112 pounds, the half of 56, and the quarter hundred of 28 pounds, the eighth of a hundred 14, and the sixteenth of a hundred of seven pounds; that the troy pound consists of 5760 grains, 7000 of which grains are of equal weight with the avoirdupois pound; that the bushel is a vessel of capacity of 2150.42 cubic inch-

* "The authority of Congress to act is comprised in one line of the constitution, being the fifth paragraph of the eighth section, and first article, in the following words, '*to fix the standard of weights and measures.*'"

† It is unnecessary to point out why *spring* water could not afford a basis for the relation between weight and measure.

es, the wine gallon a measure of 231, and the ale gallon a measure of 282 cubic inches.

The various modes of division of these measures and weights, the ell measure, and the application of the foot to itinerary, superficial, and solid measure, producing the perch, rod, furlong, mile, acre, and cord of wood, may be left to the established usage, or specifically declared, as may be judged most expedient. The essential parts of the whole system are, the foot measure, spring water, the avoirdupois pound, and the troy grain."

The preservation of the original standards, and the multiplication of copies of them is provided for, as well as the method of enforcing the laws requiring their use.

Mr. Adams further proposes a comparison of the standard of length with the French metre, thus giving its relation to the quadrant of a meridian of the earth's surface, and discards the pendulum, as "since the definitive determination of the metre, useless with reference to any system of weight and measure." It ought not to be forgotten that the pendulum was the means fixed upon by the French philosophers themselves, for the recovery of the metre should the standard ever be lost or impaired, and this while the recollection of their labours and difficulties, in measuring the arc of the meridian, was fresh in their minds.

I conclude the imperfect outline just given by the summary statement of the specific recommendations made to Congress.

"1. To fix the standard, with the partial uniformity of which it is susceptible, for the present, excluding all innovation.

2. To consult with foreign nations, for the future and ultimate establishment of universal and permanent uniformity."

IV. 12. The report of Mr. Adams seems to have shared the fate of those which preceded it, so far as arousing Congress to exertion was concerned, and the subject slept until the reaction of the irregularities in the different states was felt at the treasury of the United States. During the administration of the treasury department, by a citizen of this commonwealth, S. D. Ingham, Esq., an investigation was, in pursuance of a resolve of the Senate of the United States, begun under his direction by Mr. Hassler, into the relative values of the standards of weights and measures used at the different custom houses of the United States. The standards, where any such existed, were transmitted to Washington, and it soon appeared that they were of so irregular a character, and so unworthy of confidence, that the comparison of them, indefatigably pursued by Mr. Hassler, was a task entirely beneath his attention.*

At the same time Mr. Hassler availed himself of his opportunities to examine and compare different reputed standards of weight, and therefrom has resulted the most valuable collection of results that has

* The measure which proved to be nearest to the standard, was a *folding* yard stick from Philadelphia, the length of which is stated at 36.0002465 standard inches!

ever yet appeared; valuable from the number of the comparisons made, from the variety of standards, national as well as private, compared, and from the well known accuracy of the observer.* The scientific discussions of the questions relating to weighing are of the highest authority, and the determination of the curves representing the expansion of water in different vessels, for temperatures above and below its point of maximum density, of practical importance, as well as highly interesting in a scientific point of view.

13. With these points the committee are not at present directly concerned, and indeed the general conclusions might seem not to bear upon the subject of inquiry, were it not that the proposed adoption of standards of measure in the custom houses of the United States, would lead either to the adoption of the same in the localities within their influence, or to conflicting measures inconvenient to both buyers and sellers, and tending to increase instead of to diminish the present confusion. In a state where standards are already fixed by law, and cannot be changed but by a law of the state, or by the adoption of a system by Congress, when the law provides for a change, and where custom houses exist, the introduction of standards, differing from the state standards, must produce great inconvenience. It becomes the committee, therefore, to examine the provision of this report to the treasury department. They are as follows:

Standard of length;—A scale of 82 inches in length by Troughton, the divisions being copied from the same scale from which the scales used by Sir G. Shuckburg Evelyn, and Capt. Kater, had been obtained, and proved to be nearly identical with the English standard. This scale was obtained by Mr. Hassler for the coast survey in 1813. Standard temperature 62 degrees Fahrenheit.†

Standards of weight;—The avoirdupois pound to be deduced by the ratio of 7000 grs. to be 5760, from the troy pound in possession of the United States Mint, at Philadelphia, and prepared by Bate, in 1824. under the direction of Capt. Kater, of the British navy. The standard of liquid measure, the wine gallon of 231 standard cubic inches; and of dry measure the Winchester bushel, of 2150.42 cubic inches, the first containing at the point of maximum density of water, and 30 inches of the barometer 8.338888220lbs. avoirdupois, and the last 77. 627413lbs. avoirdupois.

V.—14. A resolution for inquiry in relation to a system of weights and measures for our state, produced an elaborate report from Mr. John S. Dorsey, chairman of the committee on the subject, to our state senate, in the year 1808.

Mr. Dorsey gives a lamentable account of the condition of the so styled standards of the city of Philadelphia, which, independently of the

* For comparison with part of his observations, Mr. Hassler availed himself of measurements made by a distinguished French astronomer, M. Nicollet, then at Washington on a scientific tour through our country. It is needless to say that the results were entirely satisfactory, testing the accuracy of the observers.

† In inches of this scale, one of the New York state county standard yards, the only state standard which I can find was compared, was 36.01545 inches.

doubtfulness of their claims to exactitude when originally introduced, had lost by use, all pretension to be considered as standards. On the subject of the system in common use, Mr. Dorsey speaks thus:

"The having of various units or sources for weights or measures, is a just cause of complaint; inasmuch as that, thereby, constant opportunities for wrong are afforded, which in their operation generally affect a class of society, who are least able to sustain the injury. These happen most frequently in articles of the first necessity, and the practice is predicated on a supposed want of knowledge of the various kinds of weights and measures, combined with their more various usages."

After enumerating the various frauds to which such a looseness of system may give rise, the committee gave it as their opinion, "that there should be but one unit standard, or source, for measures of extension; one unit standard, or source, for measures of capacity; and one unit standard, or source, for weight; one office for regulation for each county; one mode of measurement by measures of capacity, *to wit:* strike; and one mode of weighing, *to wit*: nett hundred."

15. A good examination of the history of British weight and measure follows, and a brief allusion to the French system, in which the committee endeavour to point out why it may not be generally, or universally adopted. The report concludes by offering an act, the provisions of which are marked with considerable boldness.

1st, The unit of length to be the English standard foot. The subdivisions to be decimal; but the multiples irregular. The superficial measures to be derived from the foregoing linear measures.

2nd, The measures of capacity to be derived from that of length by cubing, with the peculiarity that the cubic foot is the highest acknowledged measure, of which, though the regular divisions are decimal, binary divisions are allowed.

The cord of wood and of bark are defined to be 128 cubic feet, well stowed and piled.

The load of earth, &c. is fixed at 1 cubic yard, or 27 cubic feet, that of stone, at 16½ cubic feet, and of charcoal at 100 cubic feet. No heaping is to be allowed.

3d, The standard of weight is to be derived from the weight of a cubic foot of water, at 60°F. at 1000 avoirdupois ounces, ten ounces forming the *unit* of weight.

The materials of the standards, the precise manner of arranging them, and of their preservation, is described, and a peculiar nomenclature attached to the system; into this I have not thought necessary to enter. As this report is accompanied by the only detailed act since 1700 and previous to 1833, the committee may choose to have it reprinted for their use, together with the act of 1700, its supplement of 1705, and the act of 1813.*

* These documents have been collected for the Library of the Am. Philos. Society, by the indefatigable attention of the librarian, John Vaughan, Esq.

VI.—16. In January, 1822, a committee, of which Condie Raguet, Esq., was chairman, made in the State Senate, a brief report on this subject. The speedy action of our national councils being at that time expected, the committee recommended, simply, provisional measures and requested their discharge.

The subject of weights and measures in our state legislature, up to the date of this report, is closed by a reference of the bill now before the committee, to the managers of the Franklin Institute.

An abstract of the provisions of the present bill will be found in note (D) appended to this abstract.

VII.—17. The report of Professor Renwick, upon which the present system of weights and measures of the state of New York, is founded, contains so lucid, and yet so brief a statement of the scientific data concerned in the arrangement of a system, that it ought to be entire before the committee.

Considering an entire change of system to be inexpedient, if not impossible, Professor Renwick confines his views to the proper methods for fixing existing denominations and standards, and for their verification, or recovery, when lost. The results consist in the recommendation, 1st, That there shall be one standard for length and surface, one for weight, and one for measures of capacity. 2nd, That the standard of linear measure be the yard used in the State at the time of the declaration of independence; and that to insure the recovery of the standard if lost, or its verification if required, the ratio of the length of this yard to the pendulum with a brass rod vibrating seconds, in vacuo, at the temperature of melting ice, at the level of the sea, and in some given latitude and place, be declared. 3d, That the standard of weight be derived from that of length, by the weight of a cubic foot of water, being declared to be in vacuo, at its maximum density, and weighed with brass weights, 62½ pounds: the ounce being the sixteenth part of such a pound. 4th, That the unit of measures of capacity, dry and liquid, be the gallon, to contain at the mean pressure of the atmosphere and level of the sea, ten pounds of distilled water, at its maximum density. All other measures of capacity, to be deduced from this by continued multiplication or division, by the number two.

These recommendations were substantially adopted in framing the law, but the introduction of a liquid gallon to contain 8lbs. of water at its maximum density, destroyed the uniformity contemplated in the liquid and dry measures.

NOTE A.

Table showing the proportions of the measures of capacity of England, at different periods.

(Taken from a corresponding table in Mr. Adams' report. p. 142.)

Date of Statute.	Wine gallon.		Corn and Beer gall.		Bushel.		Remarks.
	Statute Standard.	Existing Standard.	Statute Standard.	Existing Standard.	Statute Standard.	Existing Standard.	
	Cubic Inches.		Cubic Inches.		Cubic Inches.		
1225						2124.[1]	[1] Exchequer bushel of 1091.
a						2124.[2]	[2] do. of Henry VII.
1266	217.6	217.6	266.3	266.25*	2130.4	2128.9[3]	* Rumford gall. of 1228. [3] do. Eliz. 1601.
1353							
a						2145.6	Winchester bushel at exchequer.
1439	219.45	217.6	268.53	266.25	2148.24	2150.42	do. by statute Wm. III.
1496	224.	224.†	224.	None.	1792.	None.	† Guildhall gallon in 1688.
				280.‡		2224.	Excheq. bushel Henry VII. ‡ Exchequer qt. of 1601.
"	"	"	280.	278.4[a]	2240.	2217.62	Coal bushel of Anne. *a* Exchequer pt. of 1601—2.
				272.[b]			*b* Excheq. gall. Hen. VII.
				271.[c]			*c* Gall. 1601, marked EE.
"	"	"	272.	270.4[d]	2176.	None.	*d* " " E.
"							
1531							
1705	231.		282.	282.[e]	2256.	None.	*e* Treasury ale gallon.

NOTE B.

The point in question may be thus stated; that the natural system of metrology requires two sets of measures; one for liquid and the other for dry substances, and two sets of weights; or, in the language of Mr. Adams, "the result of these reflections is, that the uniformity of nature for ascertaining the quantities of all substances, both by gravity, and by occupied space, is a uniformity of proportion, and not of identity; that, instead of one weight and one measure, it requires two units of each, *proportioned* to each other; and that the original English system of metrology, possessing two such weights, and two such measures, is better adapted to the only uniformity applicable to the subject recognized by nature, than the new French system, which, possessing only one weight and one measure of capacity, identifies weight and measure only for the single article of distilled water; the English uniformity being relative to the *things* weighed and measured, and the French only to the instrument used for weight and mensuration."

The arguments which are advanced are,

1. "The relative value of all the articles which are bought and sold by measures of capacity, is a complicated estimate of their specific gravity and of the space which they occupy. If both these properties are ascertained by one instrument for any one article, it cannot be applied with the same effect to another. Thus the litre, in the French system, is a measure for all grains and liquids: but its capacity gives a weight only for distilled water. As a measure of corn, of wine, or of oil, it gives the space they occupy, but not their weight. Now as the weight of those articles is quite as important in the estimate of their quantities, as the space which they fill, a system which has two standard units for measures of capacity, but of which each measure gives the same weight of the respective articles, is quite as uniform as that which of any given article, requires two instruments to show its quantity; one to measure the space it fills, and another for its weight."

Is it correct to say that the relative values of all articles depend upon a compound of their bulk and density, or in other words, upon their mass? Is not the estimate of value to be fixed as well upon a given bulk as upon a given weight? Do we compare the relative values of wines, or even of the different kinds of spirits, by their specific gravities? And if these views were correct, would they not justify a separate measure for every article sold, for tea, coffee, sugar, and milk, as well as for wheat, wine, or oil? Does it matter in the present state of society, whether corn and wine were once the first necessaries of life, and produced separate natural standards, defined by the relative gravities of corn and wine?

2. "This diversity is, therefore, founded in the nature of things; and may be stated in the following rule: that whatever is sold by weight in *measures* must have a measure for itself, which will serve for no other article, of different specific gravity; and as wheat and wine are both articles of that description, as their specific gravities are very materially different, although they are very suitable to be weighed by the same weight, they yet require different measures, to place them in equipoise with that weight."

The objections which I have just urged seem to apply, in force, to the argument now stated, which Mr. Adams has thus happily answered. "Our country is not a land of vineyards. We have no flowery dales of Sibma, clad with vines. Wine is an article of importation; an article of luxury, in a great measure confined to the consumption of the rich. Its distribution in measure, and the exactness of the measure by which it is distributed, is not an incident which every day comes home to the interests and necessities of every individual. We have less reason for regretting, therefore, the loss of a measure which would prove its integrity by its weight; and more reason for preferring the uniformity of singleness in the French system of capacious measures, to the uniformity of proportion which belonged, originally, to the English. That proportion itself we have lost by the establishment of a wine measure of 231, and a corn bushel of

2150 cubic inches: and although it exists in the troy and avoirdupois weights, and in the wine and beer gallons, it exists to none of the useful purposes for which it was originally intended, and to which, in former days, it was turned."

"The consumption of wine in modern times is exceedingly diminished, not only by the substitution of beer, and of spirits distilled from grain in the countries where the vine is not cultivated, but by the use, now become universal, of decoctions from aromatic herbs and berries. Tea and coffee are potations unknown to the European world until within these two centuries: and they have probably diminished by one half the consumption of wine throughout the world."

3. "The measures by which solid and liquid substances are sold are not, and cannot conveniently be, the same."

The reasons given I submit to the committee.

I. Because the form and nature of the vessels in which they are and must be kept, are different in the two classes of substances.

II. Dry substances are most conveniently measured, liquids weighed.(?)

III. The purchase and sale of dry and liquid substances, is not at the same times or places, nor by the same persons.(?)

IV. "There are conveniences in the intercourse of society, connected with the use of smaller and more minutely perfect weights and measures of capacity, for sales of articles by retail, than by wholesale, and for articles of great price though of small bulk."

V. "There is, finally, an important advantage in the establishment of two units of weights and measures of capacity, by the possession in each of a standard for the verification of the other."

NOTE C.

Legal provisions for Weights and Measures in the several states up to 1821. (*Extracted from the report of J. Q. Adams, Secretary of State.*)

MASSACHUSETTS.

1647. Measures to be provided from the mother country. No troy weights named.
1692. Declares weights to have been derived from the exchequer of England, and the measures to be Winchester measures.
1705. Troy weights to be procured for silver, bullion, &c.
1730. New set of avoirdupois weights, introduced from the exchequer, and measures Winchester measures. In use to this day.
1800. Standards confirmed by state law.
1804. Troy weights stated to be too light, and a specific number of grains directed to be added to each one.

NEW HAMPSHIRE and VERMONT.

1718 a 1797. Weights of Exchequer of England, and Winchester measures. No troy weights by law.

RHODE ISLAND.

No law. Standards derived from Massachusetts.

CONNECTICUT.

1800. Bushel to contain 1099 cubic inches, (probably a copy of that of 1670 of England.) Ale gallon 282 cubic inches. Wine gallon 224 do.; changed
1801. in 1801 to 231 cubic inches. No troy weights by law.

NEW YORK.

1703. Weights and measures according to English exchequer.
1784. Measures recited to have been procured from exchequer made standards.

1809. A yard measure procured in 1803 from England exchequer, declared the standard of the state.
1813. Declares standards in use, at the declaration of independence, according to the weights and measures in the Secretary of State's office, to be the standards until Congress shall provide others.
1826. See abstract of Professor Renwick's report.

NEW JERSEY.

1725. Adopts the measures of weights of England.

PENNSYLVANIA.

1700. Standards to be obtained from the exchequer, provisional standards adopted. Beer to be sold retail by *beer* measure, and English assize of casks, so that it was paid for by wine, and sold by beer measure, repealed in 1705.
1705.
1813.
1833. See sketch of proposed act.

DELAWARE.

1705. Standards to be obtained from the exchequer of England.

MARYLAND.

1641. Winchester bushel adopted for two years, and still used.
1671. English standards to be procured and distributed.
1692. Law of 1671 confirmed. No beer measure.
1715 and 1765.
1781. Troy weights recognized.
1805. Mayor and City Councils of Baltimore authorized to fix the standards for that city.

VIRGINIA.

1623–4, Weights and measures not to be used unless sealed.
1631–2. A barrel of corn to contain five Winchester bushels.
1646. Weights and measures of statute 12, Henry VII, (1496,) declared the
& only legal weights and measures. Copies to be provided by sealers.
1661. So that the legal weights were not the ones really used, the latter being the exchequer standards.
1734. Provisions of 1661 confirmed omitting reference to act of 1496.
1792. Act of 1734 to continue in force until congress enact laws for regulating weights and measures.
1818. Assize of staves regulated.

NORTH CAROLINA.

Prior to revolution. Act adopting exchequer standards, and providing for the distribution of copies, and preservation of standards.

SOUTH CAROLINA.

1768. *London* standards adopted.
1785. Justices of county courts authorized to regulate weights and measures within their several jurisdictions.

GEORGIA.

1803. Standards of Savannah and Augusta declared to be those of the state.
Ordinance of city councils of Augusta prescribes *avoirdupois* weights, *wine* measure for liquids, and *Winchester* bushel for dry substances.

KENTUCKY.

1798. States that congress not having legislated, they adopt the Virginia standards of 1734.
Governor to procure standards. The bushel declared to contain 2150 2-3

solid inches, and the wine gallon 231. Copies to be made, and standards preserved by Secretary of state.

TENNESSEE.

No standards fixed.

OHIO.

1811. A half bushel of 1075 2-10ths. solid inches to be made and kept as the standard.

LOUISIANA.

French measures originally used.

1814. Standards directed to be procured to conform to those used by the United States revenue officers. Copies to be distributed, &c.
A barrel ordained to contain 3¼ American bushels.

INDIANA.

1807. Standards of English measure to be procured and distributed, and avoirdupois weights. Half bushel to contain 1075 1-5th cubic inches, a gallon 231 do. To remain in force until congress otherwise provide.

1818. Confirmed.

MISSISSIPPI.

1807. United States, or, in their absence, English avoirdupois weights and standard measures of length, and dry measures of capacity, and *wine* measures liquid. Copies to be distributed.

1815. Directions for distribution of weights and measures.

1818. Further directions for preserving standards. Confirms the standards until congress shall fix a standard.

ILLINOIS.

1819. Standards to be procured of English measure.
A wine gallon to contain 231 cubic inches. Half bushel to contain 1075.2 cubic inches. Pound avoirdupois to contain 7,020 grains troy.

ALABAMA.

1807 and 1815. Of Mississippi territory apply.

MISSOURI.

1813. Linear measure adopted, English.
Half bushel to contain 1075 1-5th cubic inches. Gallon 231 cubic inches. Avoirdupois weight.

DISTRICT OF COLUMBIA.

1802. Provides for keeping of standards fixed (?) by congress, by corporation, and the sizes of weights and measures used in the city, by the same. Corporation have conformed to statutes of Maryland.

NOTE D.

Chief provisions of the bill of 1833 *for regulating Weights and Measures in Pennsylvania.*

Provides for procuring and preserving standards. For conforming to those of the United States when fixed.

Linear standard to be the yard. Customary multiples and parts allowed.

Superficial measure. Acre defined to be 4840 sq. yds.

Capacity measures. Wine gallon 231 cubic inches.
Beer do. 282 do.
Bushel 2150.42 cubic inches.

Lime bushel 13½ ins. diam. at bottom. } 13.47 inches deep.
15 „ top. }

A cord of wood to contain 128 cubic feet.

A hogshead of cider 110 wine gallons.

Weights.—Troy pound to be equal to that of the United States mint, and the avoirdupois pound to bear to it the ratio of 7000 to 5760.

Miscellaneous.

Provides for distributing the county standards, and for verifying them, fines, penalties, &c.

60 pounds avoirdupois of wheat to pass for a bushel.

58	„	rye.
„	„	corn.
48	„	buckwheat.
47	„	barley
32	„	oats.
85	„	coarse salt (foreign.)
70	„	ground salt.
62	„	fine.
80	„	anthracite coal, 112 lbs. to make one cwt. and 2240 lbs. = 1 ton.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN SEPTEMBER, 1833.

With Remarks and Exemplifications, by the Editor.

[Continued from p. 182.]

28. For an improved *Cotton Carding Engine;* William B. Leonard, Fishkill, Dutchess county, New York, September 16.

After describing the carding engine with much minuteness, the claim is made in the following words, which is all we can afford to give. "Now, all the aforesaid parts of the foregoing described machine, such as breast, main cylinder, workers, strippers, flat, doffers, comb, &c. are well known and in common use, and to their invention I make no claim whatever; but what I do claim as new is the arrangement and location of these several parts, in the manner before described; so that a much greater proportion of the surface of the main cylinder is brought into action with the other parts.

"I am aware that this object has been, heretofore, in a measure, obtained by raising the main cylinder above the plates of the frame; in which case it was necessary to have the feed apron and table high enough to feed the card conveniently, and the doffer high enough to deliver the cotton to a can. But since I have introduced my spreading machine, I can with greater convenience, feed the card lower down," "and the depressing or placing the doffer below the centre of the main cylinder, and bringing so great a proportion of that cylinder into action with the carding parts, without raising the cylinder itself, constitutes my improvement of this engine."

29. For an improved *Rail-way Drawing Head*, for drawing cotton; William B. Leonard, Fishkill, Dutchess county, New York, September 16.

The specification of this patent is of great length, minutely describing the whole arrangement of the machinery. The object of the invention is to equalize the drawing of the bats from any number of carding engines. We can do no more than give a very general idea of the manner in which this is proposed to be accomplished. Suppose four carding engines to be placed in a line with each other, and to operate together; the drawing head stands opposite to the space between the two centre machines, and the battings from the doffers descend into troughs, or rail-ways, formed of tin, there being two such troughs extending from each end towards the centre; the bats from two machines are received in each, and carried by endless belts towards the centre, being slightly condensed in their passage by the pressure of friction rollers. At the middle, they are conducted, and pass together, through the drawing head, so as eventually to form a single sliver, which falls into a can. Should one of the carding machines stop, from any cause, provision is made to alter the stretch of the drawing heads, by disengaging machinery, so as to diminish it one-fourth, in consequence of which there will be no alteration whatever, in the size of the sliver, and no general stoppage of the machinery.

"To the invention of this rail-way, or any of its appendages, or to any part of this machinery and drawing head, which has been heretofore used, I make no claim whatever. But what I do specifically claim as my invention and improvement is all that combination and arrangement of machinery before described, by which the amount, or quantity, of stretch, or draw, of the head, is diminished or increased at pleasure, not only as effected by placing the larger increasing cog wheel on the gear end of the back roller of the front drawing head, and the smaller, or diminishing, cog wheel on the pulley end; but the order may be reversed, and the effect will be the same when properly clutched.

"And I claim this improvement, not only as applicable to this front drawing head, but also to the back head, or both heads, and to all drawing heads on which it may be useful; and not only as effected by placing the increasing and diminishing cog wheels on the back roller, but on either roller, as most convenient; and not only in the proportion described above as suitable for four cards, with which I use it, but also as proportioned to any number of cards which can be worked with it, or any difference of draw, or stretch, that may be desired.

"And I also claim the application of the belt, which serves as a carrier for the sliver between the front drawing and delivering rollers."

We think the two specifications of the foregoing machinery unnecessarily prolix and complex, but at the same time the things claimed appear to be set forth with sufficient distinctness.

30. For a *Horse Power*, for propelling machinery; Philo C. Curtis, and Linus Yale, Utica, Oneida county, New York, September 17.

In this *horse power*, there are to be four wheels, and four pinions, so calculated as to give twenty-seven revolutions to one. The horse is to be geared to a lever in the usual way, and the wheel work is to be beneath him. The last driving wheel and its pinion are to be bevil geared.

The patentees "specifically claim, principally, the making the frame and wheels of cast iron, and arranging the parts in such a manner as to occupy but a small space, and at the same time reduce the friction of the different parts by a corresponding motion of the wheels. In a business where less speed is required, the last mentioned spur wheel and pinion may be left out."

Iron wheels and frames have been so often used, if not *specifically claimed*, that a person, some time since, who took a patent for a horse power, claimed the making them in part of wood and in part of iron. The above claim to the making them altogether of cast iron, is, however, as well founded as that to the manner of arranging the parts, in which there is not the slightest shade of novelty, as it consists in the mere gearing of wheels and pinions in the ordinary way.

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31. For a *Thrashing Machine;* James Hart, and Waller S. Holladay, Spottsylvania, Virginia, September 17.

This patent is taken for the manner of constructing the cylinder and concave, which is as follows. A square bar of iron is to form the shaft of the cylinder; the gudgeons, of course, being rounded. Flat bars of iron, from sixteen inches to two feet in length, are to have square holes made through their centres, so that they will slip on to the shaft. One of them is to be put on, and against it a circular piece of plank, four inches less in diameter than the length of the bar, leaving the latter to project two inches, to form teeth, or beaters; the plank, by its thickness, regulating the distance of the teeth. A second bar is to be placed against this plank, at right angles to the former, then another plank and another bar, until there are enough for the length of the cylinder. For the sake of greater firmness the bars are let into the plank; and to keep the whole together, four screw bolts are to pass from end to end of the cylinder, through the plank and bars The concave is to be placed above the cylinder, and to be formed of plank, with projecting teeth, on the same principle.

There is no claim made, but as the whole description consists in the manner of constructing the cylinder and concave, the object of the patent is sufficiently apparent.

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32. For a *Seaman's Mattrass, or Bed;* Israel Martin, Boston, Massachusetts, September 17.

The claim in this patent is "to the using of cork shavings as a material for filling the mattrass; and to the partitions for preventing them from shifting."

A mattrass is to be made, either of common ticking, or of water proof cloth, and this is to be filled with thin shavings of cork. The mattrass is to be divided into separate compartments, by strips of cloth, in order to prevent the removal of the cork from one part of it to another. This mattrass, it is said, will be soft and yielding, not liable to become matted like hair, or dusty like moss, whilst it will serve as a life preserver.

A short time since, a patent was obtained for filling mattrasses with rasped cork, but we believe experience has shown that when so filled they are without the requisite elasticity, and that although they would be buoyant, yet when once wet they would remain so for a great length of time; other objections, it is said, were experienced when it was attempted to bring them into use. The present patentee, although he has not made the water proof covering an essential part of his mattrass, has found, experimentally, that this is a point of high importance, both as regards buoyancy and elasticity, and we believe that he now manufactures them all in this way.

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33. For a *Thrashing Machine;* Linus Yale, of Otsego, and Philo C. Curtis, of Utica, Oneida county, New York, September 17.

The concave is to be a semicircular trough of cast iron, supported on suitable legs, and having rows of teeth projecting from its interior. The cylinder is to be made by bending round, and brazing, or riveting, sheet iron of one-eighth of an inch in thickness. This is to be set with teeth of iron, or steel, and to have wooden or iron heads to receive a shaft, which revolves in boxes at the ends of the semicircular concave.

The claim is to the "cast iron frame, the sheet iron cylinder, and the form of the spikes, or cogs, and manner of fastening them into the cylinder.

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34. For an improvement in the *Metallic Slides and Cases for Ever-pointed Pencils;* James Bogardus, city of New York, September 17.

The improvement here patented consists in so arranging the parts of an ever pointed pencil case, that the point which holds the pencil shall be obtruded and detracted without having a slot in the side, with a ferule and pin to draw it down, as is ordinarily done. The exterior case consists of a continuous cylindrical tube, without projections or openings. To cause the point which holds the pencil to protrude, the head of the pencil case is made to revolve; this acts upon an interior tube by means of a quick threaded screw, which should, in preference, be made left handed. The chamber for spare pencils, and the holding point, remain as heretofore. A competent workman will readily conceive, without the aid of the drawings, how the respective parts should be arranged. In the specification, these are clearly set forth, and the claim is to "the application of the coarse

thread screw, either direct or back-handed, and the general arrangement of the parts as herein described."

We presume that pencil cases may be made in the way proposed at a cost but little exceeding the usual construction, and they will certainly be more neat, and less liable to admit lint and dust from the pocket.

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35. For a *Machine for Cutting Biscuit, Crackers, Pilot, and Navy Bread;* Joseph Clark, city of Philadelphia, and Henry Henderson, city of Baltimore. First issued September 13, 1830. Surrendered and reissued on an amended specification, September 18, 1833.

We noticed the specification of this patent in vol. vi. p. 302, where a general description of the machine will be found, with some remarks upon what we deemed defects in the claim. In the new specification this is substantially altered; it is in the following words—

"What we claim as new, and as of our own invention, is, 1st, the continuous motion of the rollers, which prepare the dough for cutting and moulding, and deliver it upon the surface on which it is to be cut and moulded, produced by the same power that moves the cutters, and cuts and moulds the dough, combined with cutting and moulding perpendicularly upon a flat surface, the rollers continuing in motion while the dough is being cut and moulded. 2nd. The stoppage of the surface on which the dough is cut and moulded, at the instant of cutting and moulding, in combination with the continuous motion of the rollers which prepare the dough for cutting and moulding. 3d. The elevation of the rollers above the surface on which the dough is cut and moulded, and their distance from the cutters, to permit the dusting, or brushing, of the dough with flour preparatory to its being cut and moulded, and to permit a sag, or bending downwards, of the dough, between the rollers and the surface on which the cutting or moulding takes place, and so compensating for the difference between the continuous motion of the rollers and the interrupted or irregular motion of such surface, as well as obviating any difficulty arising from the varying elasticity of dough made from different kinds of flour. 4th. The arrangement of the mechanical parts in such combination as to produce the above described effects."

"Note.—Various modes may be employed to communicate power from one part of the machinery to the other. Cog wheels might be substituted in place of a band, and the sliding board might be moved forward by a catch, working on a ratchet wheel, as the carriage of a saw mill is moved."

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36. For an improvement in *Bedsteads;* Gideon Vaughan, jr., city of Philadelphia, September 18.

This bedstead is called "the rocking and ventillating bedstead, by a fan tester." The tester is supported upon four corner posts, like those of a high post bedstead, there being a rail connecting the two

head posts, and another connecting the two foot posts near to the floor, but raised from it by means of castors.

The side and end rails of the bedstead are framed together independently of the corner posts, and this frame has rockers under it, which rest upon the rails near the floor. When the rocking motion is not required, there are hooks and screws to render the sacking frame stationary. The fan extends along under the tester, and is to be vibrated by a cord, like those along the dining tables of steam-boats. This cord is to be worked by the person in bed, or otherwise.

The claim is to "the combination of the bedstead, or crib, or rockers, with the external frame, bed posts, tester, and fan and screw, in the manner herein described, so as to unite the advantage of a stationary bed, of rocking, of ventillation, and of simplicity and economy, in one machine or invention."

In the bedstead as described and represented, there are, besides the four corner posts already noticed, two others, which are in the middle between the head and foot posts, passing up to the tester, and supporting the gudgeons of the fan. We thought of omitting the notice of these, as they look very much out of place, and appear to be about as necessary as "a fifth wheel to a coach."

This, we think, is one of those improvements which most people will be willing to do without, and we doubt, very much, whether the patentee will meet with sufficient encouragement to induce him again to favour the public with the fruits of his genius.

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37. For *Machinery for Propelling Steam-boats, and other Vessels, in lieu of Water Wheels;* John M'Curdy, of Norwich, Connecticut, but now residing in the city of London, September 18.

The apparatus which is the subject of this patent, is called "the duplex crank propellers." Paddles of any form which may be preferred, are to dip into, and to leave the water vertically; each paddle being operated on by two cranks, the shafts of which are placed horizontally, one above the other. The two cranks appertaining to each paddle must be equal in length, and when attached to the paddle handle, must stand in the same direction; they will then, in their revolution, carry the paddle so that every part of it will perform a circle equal to the sweep of the cranks. There may be several pairs of cranks, on the same shafts, each carrying its own paddle, and standing at different angles, so that some of them will always be acting on the water. The claim is "simply the arrangement and connection of the rods, or arms, to the double cranks, acting together, with the paddle attached to the lower end, by the principle of this motion forming a complete propeller."

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38. For a *Washing Machine;* Samuel Swett, jr., Readfield, Kennebeck county, Maine, September 18.

Although this is a washing machine, and has been preceded by hundreds of others, against which we might write ditto, ditto, it yet comes

forward with some claims to novelty, which alone gives it a title to our consideration; but besides this, if the inventor's account of it be admitted as sufficient proof of its goodness, the clothes put into it will be "thoroughly cleansed, which cleansing is effected in half the time, and with less than half the labour expended by any machine which has yet come under his observation. Its superiority consists in its simplicity; the ease with which it may be worked, even by children; the effectual manner in which the washing is completed, and the avoiding of the most disagreeable part of the labour, as washing is ordinarily conducted."

The novelty consists in the form of the revolving vessel in which the clothes are to be put. Each end of this is made by taking two boards about three feet in length, and eight or nine inches wide, and halving them together flatwise, so as to form a cross, as in the margin; these are to be placed fourteen or fifteen inches apart, and one side of each covered by nailing on a board; the opposite side is to be in part boarded, and in part formed by open slats; end pieces are also to be nailed on, each of them having thirty-five pins inserted in them, which project within the box; each of the sides of the box is to be fluted crosswise, in the manner of the common washboard. The part with slats forms doors for admitting and removing the clothes.

This box is to have gudgeons attached to the centre of each of its ends, and is so placed that it may be made to revolve in a trough, which is to contain the suds. It is then to be turned slowly, so as to allow the clothes to fall from end to end. The claim is to the general form of the machine,

Should the extent of its use be commensurate with the space we have given to it, compared with that usually allotted to washing machines, it will do well.

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39. For improvements in the *Plough;* Sarah Evans, and John M'Faden, executors of George Evans, deceased; Pittsburgh, Pennsylvania, September 18.

The improvements for which this patent is obtained were made by Mr. George Evans, and a description of them filed by him in the patent office a little time previous to his decease. They consist in such matters of form and arrangement as could not be understood without the drawings.

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40. For an improvement in the *Apparatus for Steering Vessels;* Banjamin F. Adams, Boston, Massachusetts, September 19.

We are unable to make much out of this improved mode of steering, which appears to us so similar in its results to some of the old modes, as to impress us with the opinion that its utility will not be such as to supercede those in use. The inventor calls his apparatus the "steering horizontal quadrant wheels;" but for what reason we cannot tell, as the steering quadrant is vertical. Instead of a horizontal steering wheel, a quadrant of such a wheel is employed, the

arch of which is furnished with steering handles, and has on it a groove to receive the steering rope, chain, or band. The quadrant, of course, turns upon pins at its centre. A vertical shaft, behind the quadrant, has on it three horizontal wheels, the centre one of which receives the steering rope from the quadrant, which is conducted to it by two sheaves upon the deck. This middle wheel slides up and down upon its shaft, and can be made to engage with either of the other two, which are fixed on the shaft, and from each of which ropes extend to the rudder.

The claim is to "the before described horizontal steering wheels, by which the direction of a vessel may be changed by the shifting wheels; and to the quadrant for steering the vessel."

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41. For an improvement in the *Mode of using Water Power;* John Abbott, Reading, Middlesex county, Massachusetts, September 19.

The specification of this patent is altogether defective, from its referring throughout to a *model*, by which the description is to be illustrated, instead of referring exclusively to a drawing; the latter article, however, accompanies, and might probably obviate the force of any objection which should be urged on the ground mentioned. But if this defect is not fatal, there exists another which will most assuredly prove so, and that is, the entire inferiority of the mode of obtaining the power of water, to that ordinarily employed. The scheme would be found vulnerable on the score of its want of novelty, but it is needless to urge this point, because we can most unhesitatingly pronounce the thing to be without utility, in which case its novelty is of little importance.

The invention is said to consist "in applying the weight of water, at any given height, to one or more buckets, or vessels, suspended by chains, rods, or line gears, and connected with a lever beam, or operating upon a vibrating circle."

The water is to be contained in a tight flume, beneath which there are to be two buckets, which are alternately to rise and fall. They may be suspended by rods, having teeth on them which take into ratchet wheels on a horizontal shaft, so arranged that the descent of either will cause the shaft to turn in the same direction. When one of the buckets rises to the flume, the other is at the lower part of the fall. The rising bucket is to strike a rod, or other contrivance, at the bottom of the flume, which is to open a valve, and allow it to fill with water; the lower bucket, at the same moment, having valves in the bottom of it which are to be opened, is to discharge its contents by similar means; the upper bucket is then to descend and raise the lower one, and so on alternately.

This contrivance has undoubtedly been made under the false supposition that there is a loss of power in the overshot, or breast wheel, on account of the varying distance of the water from a line vertical to the centre of the wheel, and that it acts with its full power only when the bucket containing it is in a line horizontal to the centre.

We could easily muster up as many contrivances founded upon this same erroneous notion, as of those intended to do away with the crank motion in the reciprocating engine; schemes which are perfectly comparable with each other.

The patentee is manifestly aware that it must take some time for his buckets to fill and discharge, and to obviate this difficulty he proposes to introduce a pendulum, "as in the accompanying model," the vibrations of which are to give additional force to the required motion, at the point of time when its change is effected. Ought there not to be some additional contrivance to regulate the motions of the pendulum at the moment of change?

To the instructed machinist, the error of the whole scheme, as above presented, will be obvious; but there is something still less seaworthy behind, which partakes of the very essence of perpetual motion. We are informed, for example, that the principle may be indefinitely extended, and that "water being raised to an elevation by any moving power, (equal to a horse power, for instance,) may acquire by the use of the hydrostatic lever, an increased power in proportion to its height."

We do not mean to assert that the water would act with less power in this apparatus, than on the common overshot wheel, estimating merely the effect produced by its descent from a given height, but that the objections to this mode, in the time required to fill and discharge the buckets, and from several other causes, will be found not merely formidable, but absolutely insuperable, by those who may attempt to carry it into practical operation.

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42. For an improvement in *Knobs of Glass, for Doors, Furniture, &c.;* Theodore F. Abbott, Canton, Norfolk county, Massachusetts, September 19.

The introduction of a pin of iron or steel into the mould used for for forming glass knobs, is the subject of this patent. This pin is to be about one-fourth of an inch in diameter, and is to extend from the bottom of the knob towards its centre, to the distance of five-eighths of an inch, leaving, when removed, a hole of that size; "the other end may be easily broken off when the knob is cold, and a perfect hole will then be formed."

The drawing of the mould is without written references, and the description, from this cause, is wanting in clearness; perhaps, however, it may be sufficiently clear to the adept.

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43. For a *Machine for Making Shingles;* John Bush, Dayton, Tippacanoe county, Indiana, September 19.

A crank attached to a vertical shaft, turned by a water wheel, is to communicate a horizontal, reciprocating motion to a plane which is to shave and joint the shingles; at the extreme end of the plane, a cross cut saw is to be attached, which is to saw off the logs into buts, from which the shingles are to be rived, there being a suitable carriage for sustaining the log. On one side of the block which carries

the plane iron, there is a knife for riving the shingles, and a rest upon which to sustain the but. The shingles after being rived are to be jointed by an iron for that purpose, and placed under the plane to be faced, the bed upon which they lie being an inclined plane, to give them the proper taper. The claim is to the peculiar arrangement and combination of the several parts of the machine.

The whole is described in a vague manner, so that any one who should attempt to construct a machine from the information given, must possess a good portion of inventive genius, or meet with many difficulties. We apprehend, in fact, that it has not yet been essayed by the inventor, and that he, therefore, has much to learn respecting it.

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44. For a *Cooking Stove;* Levi Kingsbury, Livonia, Livingston county, New York, September 19.

An open stove, furnished with doors, and having a pipe, or flue, above, makes a part of this apparatus; behind this there is to be a shallow box, the bottom of which is formed by a continuation of the bottom plate of the open stove; this is to have side plates, which may probably be five or six inches in width, and a top plate, furnished with holes to receive cooking utensils. The back end of this box opens into the flue of a common chimney, and the lower part of the back plate of the open stove is removed, that a portion of the heat and flame from the ordinary fire may pass through the box, and into the chimney flue. A register is provided to close this opening when required, so that the box may be used for cooking when there is no fire in the open stove. There are sliding furnaces which may in this case be applied in the lower plate of the box; and this is spoken of as being a very advantageous arrangement in warm weather. It is said, that, in many cases, the heat from the fuel in the open stove, will suffice for cooking, without the aid of the sliding furnaces. The lowness of the upper plate of the box is spoken of as greatly facilitating the management of the pots and kettles.

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45. For *Preparing Milk and Cream for Making Butter and Cheese;* Calvin Ainsworth, Littleton, Grafton county, New Hampshire, September 19.

The directions given are as follows:—For making butter, one ounce of saltpetre, an ounce of *sal cileratus*, and a pound of salt, are to be put into six quarts of milk when first taken from the cow; stirring the milk until the whole is dissolved.

The cream is to be prepared for churning as follows. Two table spoonfuls of this mixture, a tea-spoonful of acid of tartar, and "a tea-spoonful of Rochelle, or acid of salt," are to be put into a bottle with a quart of cold water, and this, after being well shaken, and standing a day or two, is to be added to such a quantity of cream as will make eight or ten pounds of butter. "In hot weather, the quantity of *sal cileratus* may be increased to two ounces."

If cheese is to be made, the milk, when first taken from the cow, is

to be prepared by putting an ounce of the first preparation into every six quarts of it, one hour after which the rennet is to be added.

How, or why, this improves the butter and cheese we are not informed, and have not discovered; we suppose, however, that the mixture is a substitute for the salt usually employed for seasoning; it is certainly somewhat empirical, and we presume that one who calls sal aeratus, *sal cileratus*, and denominates something else "Rochell, or acid of salt," cannot give us the rationale of the action of these ingredients upon each other.

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46. For a *Machine for Sweeping and removing the Dirt from Streets;* Levi Kidder, city of New York, September 20.

It was intended to publish the specification of this patent in the present number, but it is mislaid. When found it is probable that we shall present it to our readers. The machine was designed for the use of the city of New York, and it was anticipated that it would produce a great saving in the business to which it was to be applied. We have not heard the result of the trial in the large way.

A cylindrical broom was to operate by means of the wheels of the machine, which was to be drawn on like a cart. This, and the receptacle for the dirt, were securely covered, the whole being managed in a manner that manifested much ingenuity. There are many difficulties, however, in the way of the successful operation of such a machine; among these may be mentioned deep holes, and other inequalities in the pavement of a city, against which it must be nearly, if not altogether, impossible to provide; others, equally formidable, might be mentioned, and we shall be glad to see that this machine has met with and conquered them.

47, For an improved *Mode of Building Walls in deep Water;* Henry K. May, Boston, Massachusetts, September 23.

Parallel rows of piles of sufficient length to extend above the surface of the water, are to be driven down, leaving such a space between them as shall be necessary for the thickness of the wall to be built. These piles are to be sustained in their places by diagonal spur shares on their outsides, and are to be capped with strong longitudinal timbers. A platform for the workmen, and to sustain the windlasses and materials, is to rest upon these caps. A stout frame is to be formed by uniting transverse and longitudinal timbers; the transverse timbers being of a length equal to the thickness of the intended wall, and the longitudinal ones, of a length equal to such section of it as is intended to be built at one time; the whole must necessarily be thus divided into distinct sections to carry the proposed plan into effect.

In forming this frame, the transverse timbers are placed at suitable distances, parallel to each other, and the longitudinal timbers upon them; one being situated near their ends on each side, and the whole secured together by trenails, or otherwise.

This frame is to be slung under the platform upon which the windlasses are placed, by ropes, attached to blocks, and passing under

the projecting ends of the transverse timbers. When so placed, the foundation of a section of the wall is to be laid upon it. The stones, cut to a proper size, are to be laid in the manner of headers and stretchers, the first row of headers extending from one longitudinal piece to the other, immediately over the transverse timbers, and the first row of stretchers extending from one of these to the other, immediately over the longitudinal pieces; these courses are to be continued, and the frame lowered into the water, until the wall reaches low water mark. The spaces between the headers and stretchers are then to be filled in with rubble work. Section after section is thus to be built, until the whole wall is completed.

A good drawing of the machinery, and mode of construction, accompanies the specification; and the claim is to "the mode herein before described, of constructing walls and masonry in deep water, and the adaptation and arrangement of the machinery and apparatus for accomplishing the same."

LIST OF AMERICAN PATENTS WHICH ISSUED IN NOVEMBER, 1833.*

With Remarks and Exemplifications, by the Editor.

1. For an *Agricultural Steam Apparatus;* Edmund C. Bellinger, Barnwell District, South Carolina, November 19.

It has been repeatedly prophesied that the day would arrive when our farmers would plough their fields, and perform many other agricultural operations, by steam; and those wights who have supposed themselves inspired upon this subject will probably find "confirmation strong," in the title of the above named patent; it will be well, however, for them to recollect that "all signs fail in dry times," and that the weather-wise are then liable to find themselves deceived. It is one thing to take out a patent, and another to carry the thing patented into successful operation. Were we to begin to furnish exemplifications of this truth, we should not know where to stop, and shall therefore leave it to every one to supply his own proofs, which he may readily do by a moderate tax upon his recollection.

In the plan before us there are to be two carriages, placed parallel to each other on opposite sides of the field to be *ploughed, harrowed, rolled, sowed, or mowed;* one of these carriages is to be furnished with a steam engine, having two cylinders placed horizontally, by which are to be turned drums, or whirls, that carry an endless band, crossing the field, and passing round pulleys on the opposite carriage. To this band the agricultural instruments are to be attached, and when one furrow has been ploughed, the two carriages are to be advanced a few inches, and the operation repeated.

In one point of view, at least, we think this a most admirable contrivance; as it will not only furnish much business for our operatives

* For a period of two months, including a part of September, and November, there were no patents issued, in consequence of a vacancy in the office of Attorney General.

should the apparatus go into general use among the agriculturists, but it will give to the farmers the means of employing all those whom the pressure of the times have thrown out of work; as, to tend the said engines, to supply the fuel, guide the plough, and perform every other operation incident to cultivating the ground upon this improved plan, will demand three or four times as many hands as are necessary in the practice of the old mode; and not only will it require more hands, but more horses too, so that those thrown out of use by rail-roads and locomotives, will sell well to the farmer; and as one branch of trade begets another, he, in his turn, will have to raise more grain, as he will have an increased *home* demand for its consumption. This is a fertile subject, but as we have other patentees waiting our respects, we must, with these few hints, leave the prosecution of it to others.

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2. For a *Knapsack*, called the "Folio Extension Knapsack;" James Boyd, city of Boston, Massachusetts, November 19.

Two frames of wood are to be made, of the length and width to be given to the knapsack, which is to be quadrangular. These frames are to be covered with leather, or water proof canvass, in such a way as to leave a space between them sufficiently large to receive the articles they are to contain. An intermediate frame of wire serves to keep the edges of the knapsack distended, and to confine it in its place. The opening into it is made on the side next to the back, and is covered by a flap; it is furnished with the straps requisite for slinging it, and with a loose flap, or roll, on the upper side, to receive a coat or blanket.

The invention is said to consist in "a new combination of materials and forms, by which a new and useful knapsack will be formed, having the advantages of greater simplicity than those hitherto in use; of being perfectly water tight; of preserving a neat appearance, whether entirely empty, or filled to its utmost extension."

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3. For an improvement in the construction of *Canal Boats;* Sylvester Doolittle, Utica, Oneida county, New York, November 19.

This boat is not "as old as the hills," because they were made before canals were dug, or rivers navigated; it, however, belongs to the class of MODERN ANTIQUES, being merely a twin boat, formed by connecting two narrow boats by a deck crossing their wales, and leaving a space between them.

All claim to invention is, very properly, omitted.

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4. For an apparatus for *Sizing Paper;* Edmund Blake, Alstead, Cheshire county, New Hampshire, November 19.

This is an apparatus intended for sizing paper in the sheet, without handling it in the usual manner; and thereby to prevent its being torn, as well as to facilitate the operation, by sizing a much larger portion at once than can be done in the way ordinarily pursued.

A water tight chest or box, is made to hold the paper and the sizing, one end of which being so attached that it can be loosened by removing the hooks, or keys, that serve to fasten it. The bottom of the chest is ribbed, or fluted, to allow the fluid to pass readily under the paper placed in it. A piece of board, called a follower, about the size of one end of the box, has fastened to one of its edges, projecting ribs, or strips, which pass into the space between the flutes on the bottom of the chest, when the follower is placed near to one end of it. A hole in the bottom of the chest, for the purpose of letting out the liquid, is closed by a plug.

To use this apparatus, the follower is placed in the chest, near to one of its ends, which is then filled with paper over which bars are passed to keep it down; the sizing liquor is then poured in, and suffered to remain until it has penetrated the paper. The plug is then to be withdrawn, in order to allow the fluid to run off, and the chest to be tilted so as to stand on its movable end; the wedges, or hooks, being loosened, the chest is withdrawn and the follower removed, by which means the paper is left in a situation which admits of its being pressed in the common way.

The claim is to the apparatus, as described.

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5. For a *Bathing Machine;* Daniel Brumley, city of New York; an alien, who has declared his intention to become a citizen of the United States, November 19.

Whether Mr. Brumley is an original inventor, or an intentional plagiarist, we cannot tell, but this we know, that the machine for which he has obtained a patent is identical, not only in substance, but even in form, with that patented by Ehrenfied and Backmann in January, 1833, and which is described in vol. xii. p. 31, with a cut showing the plan of the apparatus; which cut has also been inserted in the newspapers for months in succession. Mr. B., we observe, made the declaration of his intention to become a citizen on the 14th of August last, seven months after the original patent was obtained.

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6. For an improved *Furnace for Burning Anthracite Coal, for Heating and Evaporating Liquids*, denominated the "Railway Furnace;" William Barrett, Malden, Middlesex county, Massachusetts, November 19.

The ends which are said to be attained by the use of the furnace here patented, are, "the lessening, to a considerable extent, the expense of fuel, and the time required to attend on the fire; a more rapid heating of the fluid by a more immediate approximation of the fire to the bottom of the containing vessel; the withdrawing and applying the fire with greater facility than by any of the methods heretofore known, and the preserving of the grate bars from the effect of the intense heat of the furnace."

"The grate, with its appendages, which is used for sustaining the fuel, is made to run upon a rail-way, by means of iron trucks, or

rollers, from which circumstance it is denominated *The Rail-way Furnace.*"

The part of the specification which follows the foregoing quotation, refers to a well executed drawing of the apparatus, the general nature of which may, however, be understood without it. The carriage, or frame, which sustains the grate bars, brings the fuel as near to the bottom of the boiler as possible, and is so enclosed that no air can enter excepting that which passes through the fuel.

The grate bars are cast with a groove, or channel, along their upper sides, which groove may be three-fourths of an inch deep; this "groove in the bars protects them from injury by the intense heat of the fuel; which it does, not only by diminishing the points of contact with it, but also by retaining ashes upon each bar, which is a bad conductor of heat."

The claim is in the following words—

"What I claim as new in the furnace herein described, is that arrangement thereof by which I am enabled to bring the burning fuel, anthracite, much nearer to the bottom of the vessel to be heated than can be effected by any of the ordinary modes of construction, namely, by making the furnace in the general form described, and running the same upon a rail-way. I do not claim as my invention the mere running of the furnace upon a rail-way, this having been before done, or proposed to be done, in fireplaces of a certain description, but I claim it only in combination with the kind of furnace which I have described. I also claim the manner of securing and directing the draft between the grate bars by means of the ledges, flanches, or fillets, on each side of, and beneath, the frame of the furnace. I likewise claim the particular construction of the grate bars, grooved on their upper sides, in the manner, and for the purpose, above set forth."

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7. For an improvement in the mode of cutting and making *Shirt Collars;* William J. Cantello, and Robert M. Kerrison, city of Philadelphia, November 19.

These collars are either to be attached to shirts, or used separately from them; and they are called the "Belvidera collars." A drawing accompanies the description, which shows the manner of cutting the various parts; and by a quotation from the specification it will appear that the aid of the natural sciences has been invoked in the formation of them.

"The band is broader than heretofore used, and tallies in breadth with the length of the neck, and is made as nearly as possible to fit and adapt itself to the shape of the human neck and adjacent parts. For this purpose, the lower edge of the band is so cut as to resemble in its outline the Bow of Cupid, curving down in the centre to cover the *Crycoid Cartilage*, and the *Thyroid Gland*, and curving upwards on each side to avoid the pressure of the *Clavicle* and the *Sterno-cleido-mastoideous Muscle.* The upper edge of the band proceeds upwards on each side from the centre, in a line corresponding with

the inclination upwards of the *lower jaw bone*, to a point under the angle thereof, and thence downwards at a nearly equal angle so as to avoid the pressure of the *Mastoid process of the Temporal Bone*. A small oval piece of a size according with the parts to be fitted, is cut out of the centre of the upper edge of the band, so as to give room for the angle of the *Thyroidal Cartilage* or *Pomum Adami*." The claim is to the principle and mode of cutting, constructing, and shaping, the upper edge of the band, and the lower edge of the ruffle, as above described, and nothing more."

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8. For a *Wiring Machine, used in the manufacturing of Wire from Tin Plate;* Edward M. Converve, Southington, Hartford county, Connecticut, November 19.

This wiring machine resembles some of those which are already in use for the same purpose, but there are modes of adjustment, and variations of structure adopted in it, which are considered as improvements, and claimed as new; they are not, however, very clearly represented in the drawing, and were they so, it would not be very easy to describe them without it. The model is referred to, which would probably render the whole plain.

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9. For a *Friction Furnace for Generating Heat;* John W Cochran, Lowell, Middlesex county, Massachusetts, November 19.

(See Specification.)

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10. For an improvement in the *Machinery for Printing;* Samuel N. Dickinson, Boston, Massachusetts, November 19.

The improvements here described are applied to the hand printing press, and the first of them is intended to remove the defect occasioned by the falling of the inking roller, as it is usually constructed, into the quadrats, or spaces, between the pages of matter; the impressions being usually rendered imperfect by its pressing more forcibly on the type at the sides than at other places, as it falls into, and rises from, these spaces. To obviate this, there are to be wheels, on the gudgeons of the inking rollers, which may be of the same diameter as the rollers themselves, and these are to bear, and run upon, ways, adapted to them. These ways are so constructed as to sink down when the tympan is brought upon the form, and to rise when it is raised; for this purpose, the tympan is furnished with a tail piece on each of its lower angles, which, when it is thrown up, act upon a system of levers, and produce the effect of raising the rails: the inking rollers are then conducted over the form with regularity.

The second improvement consists in a particular arrangement of the inking apparatus, intended to equalize, and facilitate, the distribution of the ink. This it would be difficult to describe without a drawing, and we, therefore, shall not make the attempt.

The claim is to the application of a system of levers to the bed, to be acted upon by projecting pieces on the lower angles of the tym-

pan, which raise parallel rails for the purpose described; and to the mode of applying the ink fountain for distributing and equalizing the ink.

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11. For a machine for *Sawing Felloes;* William W. Forward, Hartford county, Maryland, November 19.

This machine has a saw frame composed of two upright and two cross timbers, the former are placed near together, and the latter extend beyond them, forming arms at each end, which have saws strained between them. The two upright pieces, which might in fact be in one, are guided between fender posts, and the saw frame is worked up and down by a crank and pitman, in the usual way.

There being two saws, two felloes may be sawed at once. The carriages on which the timber is placed, work on a centre pin, the distance of which from the kerf is equal to the radius of curvature. The claim is to the combination and arrangement of the several parts; in this, however, there is very little of novelty, and we see nothing essentially different from the combination previously existing in other machines for the same purpose, of which there are several in the Patent Office.

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12. For a *Churn;* Warren Eastbrook, Salem, Montgomery county, Ohio, November 19.

This churn has received, in the specification, the more dignified name of "a machine for the manufacturing of butter." It consists of a square box, within which a dasher wheel is to be turned by means of a crank; which dasher wheel is very much like such as have been frequently used in barrel churns. The wheel, we are told, "throws the cream with velocity against the end of the chest, and falling to the bottom, consequently forms a current running against the wheel, thereby receiving a greater agitation."

There is no claim made.

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13. For a *Mortising Machine;* Joseph Dennis, and Israel A. Richardson, Palmyra, Wayne county, New York, November 19.

This mortising machine differs in its mode of action from most of those which have been made for the same purpose, but still it is not new in its essential features. There is a kind of socket chisel, the outside of which is to be rectangular, and of the length and width of the mortises. Augers are to revolve within this chisel, there being two, three, or more, depending upon the relative length and width of the mortise to be made. The augers are of the screw kind, and the sides of the chisel is perforated to deliver the chips therefrom. The chisel is to be so fixed to one end of the frame of the machine, that the augers may be made to revolve within it; the stuff to be mortised is laid upon a suitable carriage, by which it can be brought up to

and forced against the chisel. The edges of this latter are chamfered inwards, and so formed as to cut obliquely as it enters the mortise. The drawing accompanying the specification is very imperfect, scarcely sufficing to show the general construction of the machine, and in regard to its details affording no light whatever.

The claim is "the use of two or more augers and a chisel, adapted to each other, and formed or constructed on the principle of those above described, to whatever purpose the same may be applied," "whether the same be placed in a frame, and operated in the manner above mentioned, or be applied in any other way for the purpose of mortising, or be operated in any other manner."

In the second volume of the first series of this Journal, p. 240, there is a report of the committee of inventions of the Franklin Institute, dated September 4th, 1826, which relates to an instrument of a similar construction, there denominated "an auger for boring square holes." And it is stated that "where a longitudinal hole, *or mortise*, is wanted, two or more augers are placed side by side, furnished with their appropriate sockets, and retained in their places by obvious contrivances." The gentleman who presented this apparatus had a machine at work for mortising the hubs of wheels. This report was drawn up by the editor, who then believed the contrivance to be new; he has since learned, however, that it had been invented some years prior to the above date.

14, For apparatus for *Distilling;* Joseph T. Dwyer, Nashville, Davidson county, Tennessee, November 19.

This invention is said to consist in a manner of constructing what may be termed the still-head, so that it will condense the aqueous vapour, and produce spirit, or alcohol, of any required strength, more effectually and expeditiously than can be done by any mode that has been heretofore adopted.

What is here intended by the still-head, is, more properly, an intermediate condenser, placed between the still and the worm tub; the still being merely furnished with a cover, but not with what is usually denominated a head. The intermediate condenser is thus constructed. There is a cylindrical, oval, or other formed vessel, placed at each end of a rectangular box, or trough, made water tight. These two vessels are connected together by a number of small tubes, placed parallel to each other, like the bars of a grid-iron. The end of this apparatus which is towards the still is raised so that the tubes may have an elevation of about thirty degrees. The containing box is to be filled with water, the temperature of which is to be regulated according to the required strength of the spirit. A tube from the top of the still leads into the upper copper vessel; and from the lower one a tube passes to the worm of the condensing tub. The aqueous vapour, which is condensed in the intermediate apparatus, is returned to the still by a tube leading back to it from the under side of the lower copper vessel.

The claim is to the general arrangement of the cylinders and pipes, but not to them in their individual capacity.

The modifications of the still have now become so numerous, that a simple description of them would fill several large volumes. There are many which are constructed with the same intention as that expressed in this specification; some of them, however, are much more complex, and if this has any special merit, it is dependent solely on its simplicity of construction; the claim, therefore, is very properly restricted to the arrangement described.

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15. For a *Corn Shelling Machine;* Frederick Elliott, Greensboro', Guilford county, North Carolina, November 19.

We derive our knowledge of the construction of this machine, almost exclusively from the drawing, the description being not only obscure, but making no mention of some of the arrangements delineated. A cylinder of wood, five inches thick, and three feet in diameter, is to be made to revolve horizontally by means of a crank turning a toothed wheel, the cogs of which take into corresponding cogs on the upper side of the cylinder. The periphery of the latter is to have iron spikes, forming projecting teeth, driven into it. Four feed hoppers, through which the corn is to be dropped, are placed at equal distances apart, over the edge of the cylinder, and a spring board beneath each of these, bears the corn against the teeth.

A fanning apparatus is to be attached, but this is of the usual construction. There is nothing in the form of a claim, although there appears to be enough of novelty in the particular arrangement of the parts upon which to found one. We doubt, however, whether this machine will be found equal to several other corn shellers, either in durability or in ease of working.

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16. For an improvement in *Spinning Cotton;* John L. Eddy, Killingley, Windham county, Connecticut, November 19.

The specification of this patent is drawn up in a very imperfect manner, and, like that above noticed, neglects altogether to distinguish what is new from that which is old. The improvement is said to be in "the building cops by self-operation on a bare spindle, called the transverse flyer." The transverse motion of the bobbins is to be given by four or more inclined planes, which move back and forth upon a carriage, and appear to operate upon the wave rail by acting upon pins which project from it, and slide upon the planes; the inclination of these gives the length of the cop.

The use of some other portions of the apparatus which are noticed in the specification, and shown in the drawing, might probably become apparent had we sufficient time to bestow on the consideration of them; but this time is a precious article, and we cannot afford to part with it without the prospect of receiving value for value.

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17. For an improvement in the *Construction of Coffer Dams;* William Easby, Washington, District of Columbia, November 19.

The coffer dam for which this patent is obtained is to be either circular, oval, or a many sided polygon. The manner of forming it does not differ in any essential particular from that commonly pursued. The patentee says, "I particularly claim the circular figure of the dam, whether a perfect circle, oval, or a polygon of many sides; dispensing with braces, and giving it greater strength."

Different forms have been given to coffer dams, suggested, of course, by the shape of the pier which is to be erected within them; we are not aware, however, that they have ever been made circular or oval; there are, in fact, but few cases in which circular coffer dams would be admissable, as it is a point of importance that the area within the dam should be no greater than is required for the laying the foundation, as, otherwise, the quantity of water to be discharged would be increased, and other evils encountered; there would, however, be a manifest advantage derived from the form, especially where the depth, and, consequently, the pressure, was great.

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18. For an improvement in the *Wheels of Rail-road Carriages;* John Elgar, Civil Engineer, city of Philadelphia, November 19.

(See specification.)

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19. For an improvement in *Moulding Crackers;* Joshua G. Driscol, Auburn, Cayuga county, New York, November 19.

This cracker machine differs entirely in its construction from all those which we have before seen, but without the drawings we can give only a very general description of it.

All that is proposed to be effected by the machinery is to roll the dough into round balls, thus preparing it to be finished by hand. The first part of the apparatus consists of a cylinder of wood, which may be sixteen inches in diameter, and three feet in length. This is made to revolve within a hollow cylinder of equal length, but larger in diameter. About one-fourth of this cylinder is removed for its whole length, and that which revolves within it is placed eccentrically, so that the space between the two may be at least as wide again on one side as it is on the other. When the inner cylinder is revolving, lumps of dough are thrown in at the wide part, and these come out in long rolls at the narrow one. They are thence conducted into a second apparatus, constructed somewhat like the former, but smaller, and fluted round, in such a way as to convert the long rolls into balls.

The claim is to the particular arrangements of the various parts of the machinery for producing the effects described.

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20. For a *Machine for Washing and Fulling;* Bohan Dewey, Milton, Trumbull county, Ohio, November 19.

A box, or trough, is made to contain the articles to be washed, or fulled, and three, four, or any convenient number of beaters or hammers, are made to vibrate within it; the vertical levers to which these hammers are attached, are hung upon pins, and worked backward and

forward by pitmen on a crank shaft. The claim is to the "applying of the lever power to the hammer." This we think a very insecure kind of claim, but should be unable, in the present instance, to suggest one which would be otherwise.

[TO BE CONTINUED.]

SPECIFICATIONS OF AMERICAN PATENTS.

Specification of a patent for improvements in the mode of Kiln Drying Wheat Flour. Granted to NATHAN TYSON, *city of Baltimore, August* 8, 1831.

To all whom it may concern, be it known, that I, Nathan Tyson, of the city of Baltimore, in the state of Maryland, have invented certain improvements in the kiln dryer, patented by Oliver Evans, on the 22nd day of January, 1808, as specified by him among certain "inventions of improvements in the process of the art of manufacturing grain into flour or meal, and for other purposes;" by which improvements in the mode of preparing wheat flour and other kinds of meal for packing, their tendency to sour, or to become otherwise injured by keeping, if not altogether obviated, is much decreased; and that the following is a full and exact description of the same.

It is a well established fact, that the various species of fermentation which take place in vegetable matter, are not produced by temperature alone, but require the presence of a certain portion of moisture. The advantage derived from the kiln drying of grain and of meal, depends upon this principle; and my improvement consists in a more effectual and beneficial mode of accomplishing the end proposed, than any of those which have been heretofore adopted.

I take the flour, or meal, either as it leaves the mill stones, or after it has been submitted to the process of bolting, and cause it to pass through cylindrical or other suitable tubes, or boxes, to which a revolving or vibratory motion is to be given, and in which the flour, or meal, is subjected to the action of steam or of heated air. The tubes, or boxes, may be constructed either of wood or of metal, according to circumstances, and they may be suspended and moved in the manner of the common bolter. Within the cylinder, or other apparatus, containing the flour, or meal, to be dried, I generally place small ledges, which may stand perpendicular to such cylinder or other apparatus, and project to such height from its inner surface, and have such direction, either parallel with or inclined to its ends, as may appear best calculated to detain, conduct, or agitate the flour, or meal, and expose it for the requisite time to the influence of the artificial heat employed.

When heated air is used as the drying agent, the cylinder, or box, containing the flour, or meal, may be made to revolve within a long oven, or kiln, with the ends of said cylinder open to receive and deliver the flour, or meal. I sometimes, however, intend to enclose the cylinder entirely within the oven, or kiln; a tube will, in this case,

pass through the cover to admit the flour, or meal, to be dried, which will then escape through another tube at the opposite end. When so constructed, the heated air will not only surround, but be contained within, the cylinder, or box.

When steam is applied for the purpose of drying the flour, or meal, I surround the tube, or box, which in this case must be made of metal, or other good conductor, with an exterior case, or jacket, within which it revolves; a sufficient space being allowed between the two for the passage of the steam or heated air, which is to be admitted from a boiler, or stove, properly constructed, and conveniently situated for that purpose; such connecting tubes, dampers, and valves, being attached to the apparatus as may be required, according to the various modifications of which it is susceptible. The steam may be admitted through a hollow gudgeon, and allowed to escape in the same way, there being tubes to conduct it to and from the space provided for it.

Instead of the revolving cylinder, or box, I intend sometimes to construct a cylindrical, or other, chamber, with suitable floors or shelves, one above the other, upon the upper one of which the flour, or meal, may be received, whence it may pass to those below it, being stirred and carried by *hopper boys*, or other suitable contrivances. Heated air will, in this case, be admitted into the chamber, and have its exit through suitable openings. For steam, the floors, or shelves, must be made double, and the steam pass through them, in ways well known to every mechanist.

A current of air, sufficient to carry off the moisture, separated from the flour, or meal, must in all cases be admitted into the cylinder, or box, in which the flour, or meal, is contained. In most cases, no particular provision need be made for this purpose; and where this may be requisite, the means of doing it are too obvious to require description. The drawings deposited in the patent office, will serve to illustrate the process and apparatus herein described; but I do not intend to confine myself to any particular form, construction, or position, of the tube, or box, or of the other parts or modifications of the apparatus. A series of convoluted tubes may be employed, forming a structure like that of the screw of Archimedes, and, indeed, an almost infinite variety of shapes may be given to the apparatus, all operating upon the same principle, and producing the same effect, with equal, or nearly equal, advantage.

What I claim as new, and for which I ask a patent, is my improvement in the drying of flour, or meal, either bolted or unbolted, by means of the application of steam, or of heated air, in an apparatus constructed in the manner, and upon the principle herein before described. NATHAN TYSON.

Experimental Results of Kiln Drying Wheat Flour, and other kinds of Meal, for which a patent was obtained by NATHAN TYSON, ***of the city of Baltimore, August, 1831.***

In our list of patents for August 1831, vol. ix. p. 102, we inserted

the title of the above named patent, with a remark that it was intended to publish the specification when the result of some experiments, then in progress, should be ascertained. The delay in redeeming this pledge, has resulted from the urgent desire of the patentee, that public attention might not be called to his plan until he should have had an opportunity of exporting his flour to places the least favourable to the preservation of that article, and of keeping it there a sufficient length of time to give the utmost certainty to the result of these tests This has now been accomplished, and in several instances, a barrel of the flour so exported has been retained when the ship's cargo was sold, and brought back on the return voyage. The subjoined extract of a letter from the patentee, written at the request of the editor, must be perfectly satisfactory on these points. Numerous certificates might have been obtained had they been deemed necessary, but the individual most interested in procuring them was not desirous of doing so, and where he is known, at least, it is altogether unnecessary.

When the plan was first made known to the editor, he had no hesitation in declaring that it must prove perfectly successful; as, without the presence of moisture, that fermentation which produces souring cannot take place. It is not a little remarkable, that a plan so simple, and so rational, should not have been adopted long since. The kiln drying of grain is a well known process, and modes of cooling and drying the flour after it has left the stones, have been universally employed, and, indeed, every step, excepting this last and most important one, had been previously taken. We published in vol. vii. p. 102, a communication from one conversant with the subject, on the souring of American flour, and more especially of that from the western country. It was there recommended to employ a wind fan to blow cool, fresh air, among the meal as it issues from the stones, and in other parts of its manufacture, for the purpose of drying it. Now to effect this object fully, it is manifest that instead of *cool* air, that which is *warm* and dry, is the most proper agent.

It appears that from eight to twelve pounds of moisture, may be expelled from a barrel of flour, when in the state in which it is usually packed. The greater part, if not the whole, of this moisture, might undoubtedly be discharged in carefully kiln drying the grain; but the consequence of this would be that superfine flour could not be made from it, as nearly the whole of the bran would be chopped up by the stones. It is probable, too, that a much higher degree of heat would be required to separate the moisture from the grain than from the flour.

Extract of a letter, dated Baltimore 3 mo., 1st, 1834.

"In accordance with thy request, I now inform thee that my flour drying apparatus has been in successful operation for upwards of two years, during which time I have prepared many thousand barrels of flour, which has been shipped to every quarter of the globe, and has

stood the test of all climates for from six to twelve months, *without any deterioration whatever*. Advices from Gibralter and the West Indies inform me that after laying eight or ten months, my flour was found to be quite as 'perfect as though just from the mill.' Within a few days past I have received the amount of the sales of a lot which I shipped in December, 1832, to Liberia, in Africa, with instructions to keep it twelve months, when it was sold, and proved to be *perfectly sound*.

"Amongst the many to whom I have sold largely of the kiln dried flour, is the very respectable house of Wm. Patterson and Sons, of this city, a copy of whose certificate is annexed. In no instance whatever have I had a complaint of the dried flour not keeping perfectly; in several instances, a few barrels have been brought back from the East Indies and the Pacific ocean, and always in as perfect a state as when first made."

CERTIFICATES.

"I do hereby certify, that I have purchased from time to time a considerable quantity of dried flour, which I shipped to the West Indies and South America—say Brazils, and round Cape Horn. That in every instance this flour kept perfectly sweet, and that I believe it would keep sweet for years in almost any climate.

(Signed,) WM. PATTERSON.

Baltimore, February 15th, 1834.

"I have visited Mr. Nathan Tyson's mills, and seen his flour drying machinery in operation, and have no hesitation in pronouncing it an important discovery, and that flour thus prepared must necessarily keep perfectly for a long time.

(Signed,) SAML. STUMP,

Baltimore, February 15, 1834. *General Inspector of Flour.*

It would be difficult to magnify the importance of an improvement in the manufacturing of flour, which effectually prevents its souring; as this is not an effect produced upon a solitary barrel or two, but not unfrequently upon whole cargoes, which become sour even during the time of short voyages to the West Indies, or the southern portion of our continent; and, indeed, large quantities arrive at New Orleans in this state, although shipped on the waters of the Ohio, immediately after it is packed in barrels. A large portion of that put up for sea stores, on all long voyages, is thus lost; and but few persons would credit the account, were we able to state the proportionate quantity of that so shipped on board our vessels of war, which is eventually thrown overboard, as totally spoiled.

Specification of a patent for improvements in the Wheels of Rail-road Carriages. Granted to JOHN ELGAR, *Civil Engineer, city of Philadelphia, November* 19, 1833.

To all whom it may concern, be it known, that I, John Elgar, Civil Engineer, of the city of Philadelphia, have invented certain improvements in the wheels of rail-road carriages, by one of which improvements they are made to adapt themselves more readily to curved roads, than such as have been heretofore used for that purpose; and by the other a construction is given to them which will render them more firm and durable than those now in general use; and I do declare that the following is a full and exact description of my said improvements.

The self-adjusting conical wheel for running upon curved roads is well known to engineers, it having been made the subject of a patent by Mr. James Wright, and a modified form of it being now used on the Baltimore and Ohio rail-road. The plan which I have devised is a new modification of this principle, by which some of the inconveniences which have hitherto attended its employment are in a great degree, if not altogether, obviated.

Instead of making the wheel conical on its whole tread, like Wright's, or of forming the conical part against the flanch, and leaving the other part cylindrical, as in those used on the Baltimore road, I form the cone on the outer part of the tread of the wheel, opposite to the flanch, leaving that part of the tread which extends from the flanch towards the opposite side, cylindrical, or nearly so, for one half of its width, more or less, and then tapering outwards in such degree as may be most convenient, according to the curvature of that part of the road which has the smallest radius.

The curved part of the road is adapted to these wheels, by widening the track in proportion to the radius of curvature, so as to admit the conical part to roll on the interior rail, whilst the cylindrical part bears upon the exterior rail. This construction obviates the objection arising from the wrong tendency of the cone when running on the exterior rail, and adapts the whole more perfectly to those parts of the road which are straight, and produces other advantages which will readily occur to experienced engineers.

In order to render rail-road wheels more firm and durable than those now in use, I form that part of the wheel usually occupied by the spokes, of two plates of iron, preferring for this purpose thick sheet iron of three-eighths of an inch, more or less, in thickness. These sheets of iron are raised so as to be concave, or dishing, forming the segments of a large sphere, or, if preferred, they may be made conical. These plates have a hole in their centres to receive the hub, or nave, and have a flanch turned up over which the hoop of the hub may pass; or, if preferred, the hub may be secured in other ways. If the rim, or tire, is of wrought iron, the plates may have a flanch turned at their peripheries, through which they may be riveted on the interior of the rim. When the rim is of cast iron, the plates may be se-

cured without a flanch, one being cast within the rim, on either side, against which the plates may fit, rivets, or bolts, passing through them, and through the flanch to secure them in their places. Other modes of fixing the plates in their places may be devised, and I do not mean to confine myself to any specific plan of effecting this object, the manner of doing so, not in any way affecting the principle upon which my improvement is founded. This mode of construction is particularly adapted to wheels for locomotive engines, that run either on common roads or on rail-ways.

What I claim as my invention in my first described improvement, is the making the wheel of a rail-way carriage conical on its outer edge, and cylindrical between said conical part and the flanch, for the purpose of adapting it to run upon curved roads, and applying it thereto upon the principle, and in the manner, hereinbefore set forth.

What I claim as my invention in my second described improvement, is the substituting of metallic plates (generally of wrought iron,) for the spokes usually employed; and the giving to such plates a form which shall be convex, either curved or conical, from the rim to the hub of the wheel.

JOHN ELGAR.

Specification of a patent for Furnaces for Generating Heat by Friction, and applying the same to economical purposes. Granted to JOHN W. COCHRAN, *Lowell, Middlesex county, Massachusetts, November* 19, 1834.

To all whom it may concern, be it known, that I, John W. Cochran, of Lowell, in the county of Middlesex, and state of Massachusetts, have invented a *Friction Furnace* for generating heat without the consumption of fuel, and applying the same to economical purposes; and I do hereby declare that the following is a full and exact description of my said invention.

Although the fact that heat may be generated by friction is one of universal notoriety, it does not appear that the idea of applying this heat to economical purposes has ever been practically acted upon; I, however, have ascertained by satisfactory experiments that it may be done to great advantage. The most convenient way of effecting the object is to prepare two metallic disks, or cylinders, say of cast iron, in the form of common mill stones, and to cause one of them to revolve against the other, under considerable pressure, which pressure may be given by the weight of one of the disks, or by that of a vessel containing water, or other fluid, to be heated, the bottom of which may take the place of one of the disks; or by weighted levers, or in any other way of producing pressure which may be preferred. When I make two disks of this description to rub against each other, I form one or both of them somewhat hollow towards the centre, on the touching sides, as a bearing on that part would tend

to diminish the friction towards the periphery, where the motion is the most rapid.

There are many ways in which I contemplate the application of this principle, as, for example, I intend sometimes to cause two disks, such as I have described, to revolve, one against the other, by power derived from a water wheel, or from any other convenient source, and to enclose them within a drum, or chamber, into which a current of cold air shall be admitted, and whence it shall be conducted by suitable tubes, after it has been heated by being brought in contact with the disks; thus using it to warm the apartments of any building, or for other purposes. Where steam is preferred, I intend sometimes to allow water to fall in a small stream upon the heated disks, and to conduct it thence through tubes to wherever it may be required. Where steam is to be generated to drive machinery, the bottom of the boiler may be made of suitable form, and to bear upon a disk revolving below it; or the bottom may be perforated to allow the shaft of a disk revolving in the inside thereof, to pass through, and to be turned by any suitable apparatus, by power derived from the steam generated by the heat from the friction, or from any other source.

These various modes will sufficiently illustrate the principle upon which I depend for rendering the heat which was latent, sensible, and active; but I do not intend by this enunciation to restrict, or confine myself to the form of apparatus herein described, or to the objects to which it may be applied, but to vary the same in any manner which I may find most convenient and efficient.

It may at first appear that the powerful friction necessary to engender sufficient heat to be usefully employed as a substitute for that extricated in the combustion of fuel, will produce a rapid wearing out and destruction of the rubbing apparatus; I, however, have ascertained, satisfactorily, that when the metals become heated, there is a degree of repulsion produced between them which admits of but little abrasion of their substance.

What I claim as my invention, and for which I ask a patent, is the application of the heat generated by the friction of pieces of metal against each other, to the purpose of heating air, generating steam, and, in fine, to all the economical purposes to which such heat is applicable, proceeding, in its production, upon the principles herein before set forth.

JOHN W. COCHRAN.

ENGLISH PATENTS.

To CHARLES WATT, *Surgeon, for his invention of a new or improved method, or process, of preparing tallow and stuff from fatty materials, and refining the same for the manufacture of Candles, and other purposes. Sealed September* 27, 1832.

This invention consists in subjecting the rough fat, tallow, stuff, or other fatty materials, to a process of boiling, with water containing a

weak solution of caustic alkali, simple, or compounded with ammonia: small quantities of alkaline solution being occasionally added during such boiling, and great care being taken to avoid saponification; and after the tallow has been liberated from the animal substances, containing gelatin, albumen, fibrin, and colouring matter, it is allowed to settle, and is then submitted to the action of boiling water containing a weak solution of acids, and is kept boiling by a gentle heat (steam being preferred) until the scum on the top of the tallow subsides; and after settling a few minutes, the tallow is again boiled in water, to wash out the acid.

In order that my process of preparing tallow may be better understood, I shall more minutely detail it, stating such proportions and quantities of water, alkalies, and acids, used to prepare and refine a given quantity of rough material, as I find best to answer the purpose; but I hereby declare that I do not intend to confine myself to the precise quantities and proportions herein stated, as it may be necessary to make some slight variation to suit the different kinds and qualities of the raw material; but I declare that the quantities and proportions herein stated are best suited to the average and ordinary kinds and qualities of the raw material.

Having put into the vat or melting vessel a quantity of water, in the proportion of about fifteen gallons to each hundred stone (of eight pounds per stone,) of rough material to be prepared and refined, the water is brought to the boiling point by the aid of steam admitted into the vat in any convenient way, or by the aid of any other means of imparting heat, steam heat being preferred, as it is not so likely to injure the body, texture, or colour, of the tallow, as the direct action of fire. I then introduce into the water in the vat or melting vessel, a solution of alkali, as potash, soda, &c. I prefer it to be caustic; or in lieu of such solution, I introduce into the water in the vat or melting vessel, a quantity of such alkaline earth, or earths, as lime, &c., as will answer the purpose, the solution containing about one pound and a half of alkali to the one hundred stone of fatty materials intended to be prepared or refined.

The rough fat having been previously chopped into small lumps, is then let down into the vat or melting vessel, and the whole is made to boil; and during the time it is in a state of ebullition, I add, occasionally, about as much more alkaline solution as will contain about a pound of alkali at each time; and this is to be added at proper intervals, namely, about every fifteen or twenty minutes. This process is to be kept up until the whole of the gelatin, albumen, fibrin, and other animal matter is detached, and until the lumps, or dabs, of fatty materials disappear, and the whole of the tallow rises to the surface of the water, taking great care that no saponification takes place during this process of boiling with the alkaline solution; but should this happen, more chopped fat, or fatty material, is to be added, until the tallow separates, which will be evinced by its rising again to the surface; the whole quantity of alkali required in this process to reduce and prepare a ton of fatty materials, not being more than about six or seven pounds. Sometimes, and more particularly

when the rough fatty materials are stale, I add about one pound of sub-carbonate of ammonia, or a pint of pure liquid ammonia, to the ton of fat, during this process of boiling.

After the rough materials are reduced to the state of melted tallow, that is, when the tallow is liberated from the gelatin, albumen, fibrin, or other gross materials, it is left to settle a short time, that is, until it becomes clear, and is then removed to the refining vat or vessel, which should be formed of wood, or such other material as acids, simple, or compound, do not act upon. Into the refining vessel I previously introduce sufficient water to cover the bottom of it to the depth of about two or three inches, and then add some diluted acid, and boil the whole, by steam, or otherwise, until all the scum on the tallow subsides. The diluted acid which I use to each ton of tallow, is about three pounds of sulphuric acid diluted with three gallons of water.

In the event of there being more rough materials to be melted or prepared, the water and alkali, (which, from being the heavier, will be found at the bottom of the vessel under the detached animal matter,) are to be pumped or drawn off, leaving in the melting vat or vessel the solid parts, lest they should contain some dabs or lumps of fat, or should, from their being thick, retain some melted tallow among them. Fresh water, in quantities as at first, and alkaline solution, or alkaline earth, as before mentioned, are then to be added, and the process to be regulated precisely as before; when the whole quantity is completed, then the under water is to be again pumped or drawn off, and if any dabs or lumps remain, fresh water is to be added to them, and alkaline solution in half the quantity to that employed upon the fresh fat: regulating that quantity according to the amount of dabs or lumps remaining.

The solid, or gross parts, left after all the tallow is reduced, and liberated therefrom, may be dried by a gentle heat, and pressed into greaves, or used for any other purpose for which animal matter is adapted.

The scum being boiled down, the second part of my process is a good criterion that the tallow is in a fit state to settle. When the tallow has been boiled with the diluted acids, in the second part of this process, and has sufficiently subsided, it is conveyed to another vessel, where it is submitted to the action of boiling water for a few minutes, which will wash the tallow free from any acid that may be mixed up with it. The water in this vessel is also boiled by steam, and if the ebullition should not be sufficient, it may be kept stirred up during the time it is boiling; and when the tallow has sufficiently settled after this third boiling, it is drawn off into the coolers, and when properly reduced in temperature, may be packed off in the usual manner.

I prefer the use of steam heat to boil the materials in my improved process, as it is not so likely to injure the body, colour, or texture, of the tallow. [*Lond. Jour.*

To WILLIAM GRATRIX, *silk dyer, for his invention of an improved method of imparting to various woven fabrics, or to the yarns or threads of which the same are intended to be composed, the colour necessary to form the required patterns thereon. Sealed January* 5, 1833.

The invention described under this patent, is for a new method of applying the colour to piece goods in general, and is effected by the following means: the pattern with which the goods are intended to be wrought, is first cut out of a thin sheet of copper, tin, or other metal, or mixture of metals, or it may be cut out of a square of silk, stout paper, or any material which is suited to the purpose, but which must first be rendered impermeable to the colour by oils, varnish, &c. The sheet, with the pattern cut out of it, is then to be mounted on one side of a frame, and the flat side of the frame and sheet placed upon the silk, or other piece goods to be wrought with the intended patterns, which goods must be previously stretched upon a plane or table fit to receive them; the colour is then rubbed over the whole surface of the sheet of metal containing the pattern, with a brush or otherwise, (in the manner of stencilling,) or the colour may be communicated through the medium of a felt absorbed with colour, and subjected to a slight pressure, such as the blow of a hammer, or a gentle pressure in any other way. This process will leave the pattern only upon the goods, the intervening surfaces of the sheet preventing the colour from marking any part of the goods but those exposed by the removal of part of the sheet of metal in cutting out the pattern.

It must be quite evident that this process is the mere adaptation of the art called "stencilling," to piece goods; which process has been adopted generally for many years, as a cheap mode of covering walls of rooms with patterns, to supersede paper hanging. It is also evident that this process would produce much the same effect as block printing in common, as many colours may be worked upon the same ground by the intervention of surfaces, containing different patterns cut therein, to suit the different colours and shades required for the completion of the pattern upon the piece goods. [*Ibid.*

To WILLIAM W. TAYLOR, *felt manufacturer, for his invention of an improved cloth for the sails of ships and other vessels. Sealed November* 8, 1832.

This invention consists in the application of a cloth or fabric made of hair, for constructing sails for ships or other vessels. The hair used for this purpose may be of such kind as is cheapest, and commonly found in the market, as ox and cow hair, which is usually employed by mixing it with mortar for plasterers' use, the short staple hair of horses, and that of the calf, the elk, or any short staple hair that may be found useful for the purpose.

The hair is combed and carded, as in woollen manufactures in ge-

neral, then taken off in slivers, and after being spun into yarn, it is to be wove into cloth or fabric by means of a common hand loom, or otherwise.

The patentee prefers that the warp threads should be made of two threads or yarns doubled or twisted together, and that the weft should also consist of two threads twisted together, that mode being the strongest and by far the most preferable. The cloth, or fabric, is to be subjected to the process of fulling, as usual in woollen manufactures, which will render it a perfect material, and capable of holding the wind as well as the common sail cloth made from hemp or flax, if not much better. Sail cloth made in this manner, and of this material, will not be subjected to the ill and rotting effects of mildew, damp, &c., but will perfectly resist the same.

The cloth, or fabric, is to be cut up and made into sails of the suitable and required shape, and the parts, or pieces, are to be sewn together by a thread made of similar hair to the cloth, and should also consist of two threads doubled or twisted together.

Sails made upon this improved plan will be totally free from the danger of the effects of damp, mildew, &c., which is the cause of the rotting of the sails now in use. [*Ibid.*

To SHERMAN CONVERSE, *gentleman, for an invention communicated to him by a certain foreigner residing abroad, for certain improvements in making or manufacturing metallic rails, for the construction of rail-roads. Sealed September* 29, 1832.

The improvements in rail-roads, described in the specification of this patent, is the application of longitudinal bars of iron, placed as tension rods under the rail, and from chair to chair successively, through the whole length of the line of rail-roads, so as to secure the chairs longitudinally; and also in the application of cross tension rods, or stretchers, to be placed transversely between the chairs and rails, so as to connect the whole crossways, and form a perfect security throughout the line; these cross tension rods acting at the same time as a stay and a brace; the whole being firmly connected by bolts, and secured by screw nuts, wedges, or otherwise, as may be found the most desirable, in the application of the same. [*Ibid.*

¶ *Magnetic Experiments on Chronometers.*

(Concluded from p. 208.)

The result of our experiments, however, with our patent balance, was sufficiently satisfactory to persuade us that we had entirely obviated the difficulties under which we previously laboured when the steel balance was employed. We then proceeded to apply it to a chronometer, and, with a view to establish our opinions of its correctness with still greater certainty, we resolved to follow up the question of magnetism by inquiring how far the rate of a chronome-

ter was influenced by the interference of an artificial magnet, when the old and new balances were applied. We accordingly made two chronometers on the old principle, the balance and spring in one of them being composed of steel, with a brass outer circle, and the other a patent balance of steel. We then made two on the new principle, with a gold spring, and a balance of platinum, silver, and brass, and assuming the non-magnetic power of these latter chronometers, and with a view to determine the relative magnetic influence exerted on the steel spring and steel balance respectively, we had one chronometer with a steel balance and gold spring, and the other with a steel spring, and balance of platinum and silver. In the former case, the deviation in rate would be attributable to the steel balance, and in the latter to the spring. Six other chronometers, varying in the different alloys employed in the gold spring, and other particulars, were constructed, and the twelve were, by permission of the Lords of the Admiralty, placed at the Royal Observatory for trial. The majority of these being entirely new chronometers, and, in fact, all of them, except 521, being made within the last two years, we were desirous, previous to the application of the magnet, &c., to have five or six months' rates, and the results were published in your Magazine for February.

After this trial, we chose out of these twelve chronometers some constructed on the principles above mentioned, with a view to place them in contact with the magnet. Those selected were Nos. 606, 605, 615, 657, 600, and 274.* No. 606 and 605, have gold springs, and balances of platinum, silver, and brass. Nos. 615 and 657, have steel springs and steel balances. No. 600 has a steel spring, and balance of platinum, and silver: and, lastly, 274 has a gold spring and steel balance. It may be necessary to remark, that No. 615 has a patent balance, the upper bar of steel, and the lower bar of brass; and this circumstance will account for the difference in the effect produced upon this chronometer, and No. 657, which has a balance on the old construction, with an arm *entirely of steel*, and the inner circle a rather stout lamina of steel, and the outer of brass. The steel bars employed, marked in the table of experiments A B and C, were each 16.12 inches in length, 1.68 inch in breadth, and 0.44 inch in thickness, and were strongly magnetised.

Great care was taken, when the magnets were not employed, to preserve their virtues uninjured. They were therefore placed in a deal box, to keep them from the dampness of the atmosphere, though, from their highly polished state, they could not contract much rust, and their opposite poles were connected by two bars of soft iron, so as to form, when in this position, the figure of a parallelogram.

It will here be necessary to recapitulate a part of our former statement relative to the particular construction of the several chronometers, before we enter into the experiments themselves, to which they have been subjected, in order that the object proposed by us in them

* The chronometers here mentioned, that were not on the trial, were constructed during that time purposely for this experiment.

may be more clearly shown, and the means employed to develop certain anticipated results may be sufficiently developed.

It must be recollected that the problems we have endeavoured to solve have been, first, to ascertain the influence of magnetism on the balances and springs of chronometers constructed on the common principles; and, secondly, assuming its existence in the former case to prove its non-influence on chronometers constructed on principles suggested by our own experience. For these purposes, therefore, the following variety in the mechanism of chronometers became necessary:—First, to prove the affirmative, that magnetism influenced chronometers, by trying two balances and springs with the usual metal, steel; and, secondly, to establish the correction of this, by producing two balances and springs composed of such metals that the rate of the chronometer should not be effected; and, lastly, acting on the presumption, that the steel balances and springs alone would indicate changes in their performance, and with a view to ascertain the influence exerted in the balance and springs respectively, a third and fourth variety suggested themselves, whereof the former was to make the balance alone of steel, and the spring of the unmagnetised metal, and the latter was the converse of this. The process which has been adopted to obtain the required results has been simply this: the arm of the balance, when in a state of rest, as has been before stated, lies exactly in the direction of a line passing through the six and twelve hours, and these, with the three and nine hours, have been the chief points to which the magnets have been applied. The bars themselves at the commencement were placed in the magnetic meridian, and were kept in that position unmoved throughout the whole series of experiments. The chronometers were then presented to the magnets, the extended axes of the bars, which were perfectly horizontal, passing through the centre of the balances.

For the sake of uniformity, the six hours of each chronometer were first presented, and subsequently the twelve, three, and nine hours, commencing at a distance of seven inches, but eventually this was reduced to three inches.

In the case of No. 657, for instance, the north pole of the balance having been ascertained to lie under the six hours of the chronometer, (for either the north or south pole must in all chronometers lie under this point,) this part of the balance was first presented to the south end of the magnet, at a distance of seven inches; and, as will be seen, the rate is affected about twenty-two seconds per diem in this position of the chronometer. The distance was then diminished to three inches, and the increase in the rate is correspondent to the change in the relative distance of the chronometer.

It must be observed, that each end of the arm of the balance in its vibrations describes an arc of 180°, sometimes more and sometimes less, the north and south ends alternately subsiding at three and nine hours. Suppose the balance now to lie in a state of rest, the north end being in juxtaposition with the south end of the magnet, so that their action, the one on the other, is mutual. The mechanism of the chronometer being applied, the north end of the balance is carried to

the nine hours, whilst the south end is brought under the three hours. The south pole of the magnet now attracts the north, and repels the south end of the balance, so that the conjoined influence of these forces causes the vibrations of the chronometer to accelerate, and the chronometer gains. Reverse this order, and let the twelve hours, or the south end of the balance, be in the vicinity of the south end of the magnet. Here the repulsive force which is exerted by the south end of the magnet upon the south end of the balance has the tendency to retard the vibrations, but on account of the impossibility of placing the magnet at equal distances from the centre of the balances, from their not being situated exactly in the centre of the chronometer, the comparison of the effects produced on the rates in different positions is rendered uncertain. The disposition of the result, however, at the six and twelve hours, are, as should be expected, contrary in their nature, and the three and nine hours position indicate a mean between these, and are quite consistent with each other in their relative effects.

The same reasoning will apply to the effects produced on No. 615. The results in this case are indeed not so satisfactory as in the former, but a special reason has been already assigned to account for the difference.

It will be gratifying to observe the constancy in the rates of the two chronometers, Nos. 605 and 606, although subjected to the same trial as Nos. 615 and 657. We confess that there is some slight appearance of an effect having been produced by the magnet in these chronometers. It would of course have been presumptuous not to have anticipated some change. The metals employed in their balances are chiefly brass, platinum, and silver. Now brass, which is compounded of copper and zinc, under particular circumstances, is very manifestly susceptible of magnetism. In the Philosophical Transactions for 1786, page 62, Cavallo has confirmed this statement by producing instances which place the matter beyond conjecture. The same philosopher has also asserted, that platina shows magnetic phenomena in a proportion nearly equal to that of brass. In fact, all metals have been supposed, more or less, to exhibit this peculiar property. It will be observed, that the effect increased in proportion to the duration of the cause, which appears to accord exactly with a recently established principle, that time is an element in the acquisition of magnetic polarity, produced by induction, as well as for its loss, when the substance in which this induction has taken place returns to its original neutral state, by the subtraction of all extraneous influence. The removal of the magnetised bars from these two chronometers accordingly was not immediately followed by a change in their rates, but a gradual approximation to their former mean rate is discernible. But this is not the case with the two chronometers having steel balances, and the fact may be explained very easily, by considering that in the case of the steel balances the application of the artificial magnets was only an extension of an effect which in some measure was previously caused by the force of terrestrial magnetism. The magnet only increased this effect by certain quantities

which were neutralised by the removal of the extra cause, and the original force produced by the earth alone retained its influence. But the case of the brass, &c., balances is widely different. Previous to the application of the magnet to these, no discernible effect was produced by magnetism: but when they were brought into the vacinity of the magnets, they were in the course of time made to possess their peculiar virtues. On the removal of the magnets, the properties they had induced were still inherited by the balances, and their polarity having been established, they now acknowledged the force of terrestrial magnetism.

Whilst this power in the balance continued, the rate of the chronometer would of course deviate from its original state by the difference which the effect induced by the magnet, (and which was now only kept up by the earth,) could produce.

The gradual decrease of this polarity is manifested by a gradual decrease in the effect produced on the original rate.

We now proceed to lay before you the rates of these several chronometers, which have been taken at the Royal Observatory with the greatest care. As far as possible, they have been compared at equal intervals of twenty-four hours, so as to produce the true daily rate.

In those cases where this has not been attended to, the proper allowance has been made, and the rates reduced to one common epoch. The thermometer is added, and the maximum and minimum obtained from the Royal Observatory records for each day, have been preferred to the registered degrees usually made at the time of comparison.

Day of Month.	CHRONOMETERS' RATES.				THERM.		REMARKS.
1833.	No. 657.	615.	605.	606.	Max.	Min.	
	m. s.	m. s.	s.	s.	°	°	
Jan. 16	— 9.1	— 8.1	— 0.1	— 2.9	40	35	
17	9.4	8.1	+ 0.3	3.3	40	35	These are the rates of the chronometers previous to the application of the magnets.
18	8.5	7.4	0.1	2.5	39	34	
19	8.5	6.7	0.1	3.2	36	33	
20	7.4	7.6	+ 0.2	3.3	38	27	
21	7.2	6.9	— 0.4	3.1	33	26	
22	7.3	7.1	+ 0.4	4.0	32	23	
23	+ 14.7	+ 3.2	— 0.2	3.6	35	20	The magnets were here applied at a distance of 7 inches from the chronometers in the following order:—
24	16.5	3.5	+ 0.2	3.1	36	24	
25	20.0	0.3	0.1	2.9	33½	24	Magnet A, south end to 6 hrs. of No. 615, and
26	18.6	4.3	0.2	3.3	39	29	
27	12.1	3.8	0.4	2.9	41	31	north end to 6 hrs. of No. 605.
							Magnet B, south end to 6 hrs. No. 657, and north end to 6 hrs. No. 606.

Day of Month.	CHRONOMETERS' RATES.				THERM.		REMARKS.
1833.	No. 657.	615.	605.	606.	Max.	Min.	
	m. s.	m. s.	s.	s.	°	°	
Jan. 28	+34 35.8	+ 11 4	0.9	2.6	43	36	The distances of the magnets decreased to three inches. Order of position as before.
29	38 3.4	12.7 *	1.0	2.6	40	35	
30	39 3.7	15.5	0.9	3.1	37	35	
31	38 27.3	+1 13.0	0.8	3.0	36	28	* The centre of the balance was found to be below the line of the axis of the magnet; it was therefore raised the required quantity.
Feb. 1	39 15.0	1.17.5	+1.2	3.0	36	32	
2	35 54.4	1.16.2	—0.5	4.3	52	30	
3	37 20.7	1.12.0	+0.3	3.4	50	31	
4	—4 5.3	— 4.7	—1.1	4.3	54	39	Order of position changed.--Magnet A, south end to 12 hrs. No. 615, and north end to 12 hrs. 605.
5	1 14.2	3.8	1.6	4.7	54	49	
6	8 49.0	4.4	1.1	4.4	50	48	
7	4 4.2	4.9	0.5	4.5	56	44	
8	3 48.8	5.4	1.0	4.7	53	42	... B, S. end to 657, N. end to 606.
9	3 20.5	4.0	1.6	4.0	45	38	
10	13 8.0	3.8	1.7	4.7	47	34	Distance of Magnet 3 ins.
11	+5 2.0	+ 4.6	1.8	4.0	52		Order of position changed.--Magnet A, south end to 9 hrs. No. 615, and north end to 9 hrs. 605.
12	8 23.3	6.0	0.9	4.7	53	39	
13	8 20.0	6.2	1.9	4.0	51	39	
14	5 47.2	8.0	1.8	5.0	48	40	... B, S. end to 657, N end to 606.
15	5 42.0	10.5	1.6	5.0	42	35	Distance of Magnet 3 ins.
16	+5 43.6	+ 5.3	1.7	4.6	42	29	Order of position changed.--Magnet A, south end to 3 hrs. No. 615, and north end to 3 hrs. of 605.
17	4 0.7	5.3	1.7	5.9	50	31	
18	5 3.7	6.4	1.6	5.8	46	36	
19	5 11.5	6.0	1.5	6.0	46	35	.·. B, S. end to 657, N. end to 606.
20	9 17.2	7.1	1.9	5.8	44	40	Distance of Magnet 3 ins.
21	— 7.2	— 6.8	1.7	5.3	46	38	Magnets removed.
22	7.0	6.3	1.0	6.0	44	38	
23	7.3	6.5	1.3	5.8	43	35	
24	7.0	6.0	1.3	5.7	47	30	
25	7.1	5.4	1.7	5.0	48	35	
26	6.8	6.0	1.0	4.7	50	35	
27	6.4	6.0	1.2	4.8	48	35	
28	6.4	6.1	0.5	4.0	46	31	
Mar. 1	6.5	5.3	0.0	4.0	47	34	

The fact, then, of the ill effects produced by the usage of steel in the balance and spring being established, we will show how far the evil is felt on each of them respectively. The chronometers employed on this occasion were well calculated for the purpose, as will

be seen by consulting the few daily rates given previously to the application of the magnet.

The same process has been adopted in these as in the other experiments. The utmost care has been taken in comparing the chronometers; in fact no error of 0s,1 can in any instance have arisen.

The particular construction of these chronometers has been already explained—it may, however, be advisable again to state, that any change produced in No. 600 by the interference of the magnet is to be attributed to the steel spring, and in No. 274 to the steel balance. As might be expected, the effect of the magnet on the chronometer with the steel spring is by no means proportionate to that with the steel balance, which indicates changes quite analogous to those explained in the rates of chronometers 615 and 657.

Daily rates of Messrs. Arnold and Dent's Chronometers, 1833.

DAY.	Chrn. 600. Bar. C.	Chrn. 274. Bar. C.	REMARKS.
	s.	m. s.	
Jan. 17	+ 0.1	+ 1.0	Rates taken previous to the application of the Magnetic Bar.
18	0.1	1.0	
19	0.3	1.5	
20	— 0.6	1.6	
21	+ 0.1	1.5	
22	— 0.1	1.3	
23	+ 0.1	1.7	
24	— 0.1	1.5	
25	— 0.9	1.2	
26	— 1.2	1.3	
27	— 0.8	1.2	
28	— 0.5	1.3	
29	— 1.2	1.0	
30	+ 3.3	+2 53.0	Magnet C, north pole to 6 hrs. of 600.
31	2.5	3 10.7	....., south ..... 6 hrs. of 274.
Feb. 1	3.3	2 56.3	Distance of bar = 3 inches.
2	4.0	2 38.5	
3	3.2	2 39.0	
4	— 2.0	— 1.12	Magnet C, north pole to 12 hrs. of 600.
5	3.3	4.8	....., south .... 12 hrs. of 274.
6	3.3	4.9	Distance of bar 3 inches.
7	3.7	6.3	

DAY.	Chron. 600 Bar. C.	Chron. 274 Bar. C.	REMARKS.
	s.	s.	
Feb. 8	+ 0.8	+ 10.5	Magnet C, north pole to 9 hrs. of 600.
9	0.6	10.0	....., south ..... 9 hrs. of 274.
10	0.7	10.5	Distance of bar=3 inches.
11	1.0	10.5	
12	1.2	10.3	
13	1.0	10.8	
14	1.1	17.2	
15	1·1	17.3	
16	— 1.4	+ 21.0	Magnet C, north pole to 3 hrs. of 600.
17	2.0	20.0	....., south ..... 3 hrs. of 274.
18	1.2	20.8	Distance of bar=3 inches.
19	0.8	20.0	
20	1.0	12.9	
21	1.2	20.3	
22	1.2	20.7	
23	0.8	20.3	
24	0.8	20.4	
25	— 0.6	+ 2.7	Bar removed.
26	0.3	2.5	No. 274, 6 hrs. to north. s.
27	0.5	3.5	..... Mean rate for 3 days=2.9.
28	— 0.5	+ 1.5	..... 6 hrs. to south. s.
Mar. 1	0.8	2.0	..... Mean rate for 5 days=1.5.
2	0.9	1.7	
3	1.0	1.8	
4	1.0	0.5	
5	— 0.6	+ 2.5	..... 6 hrs. to north. s.
6	0.5	2.7	..... Mean rate for 3 days=2.8.
7	0.4	3.0	
8	— 1.0	+ 1.5	..... 6 hrs. to south. s.
9	1.2	1.7	..... Mean rate for 3 days=1.6.
10	0.7	1.8	
11	— 0.7	+ 3.1	..... 6 hrs. to north. s.
12	0.6	3.0	..... Mean rate for 3 days=2.9.
13	0.8	2.7	

On the removal of the bar, the rates of No. 274 were taken in different positions with respect to the north and south points of the horizon. The sensibility of the chronometer to be effected by these variations in its positions is very evident, and immediately corroborates an assertion which we made of this kind in the first part of our letter. Taking the mean of the three positions, with the six hours to the north, which equals + 2s.9 per diem, and the mean of the two positions with the six hours to the south, which equals +1s.5 per diem, the difference produced by these changes amounts to 1s.4.

We trust it will be unnecessary to intrude any farther on your

time in endeavouring to establish the point we set forth with, that magnetism affected the rate of a chronometer. We have not worked out our results by any abstruse formula, as the experiments required no such assistance. The simple matter of fact is here stated, and if we have not succeeded in fully developing our plans and modes of proceeding, we venture to hope that the novelty of the experiments, together with the extreme difficulties which always attend innovations on an old established principle, may be our sufficient apology.

With every acknowledgment, Mr. Editor, for the attention which our experiments for the improvement of science have met with at your hands, we beg leave to subscribe ourselves,

Your very obedient servants,

ARNOLD & DENT.

Observations as to the cause of the Spontaneous Combustion of Charcoal, in reference to Colonel Aubert's and Mr. Hadfield's experiments. By Mr. F. COXWORTHY, of the Ordnance Department. Dated London Mechanics' Institution, January, 1832.*

The spontaneous combustion of carbonaceous substances is a phenomenon which has long been under consideration, not only in respect to charcoal, but also of that body mixed with oil, of flax, hemp, hay, and others; and although numberless experiments have been made, no one, to my knowledge, has ever advanced an opinion as to the cause, which, in respect to charcoal, I consider as being solely attributable to the decomposition of moisture by potassium.

When it is considered that the oxidation of metals is difficult in proportion to their being protected by the earths or other substances, as is show by iron, during the process of copper smelting, it will not appear strange that potassium, notwithstanding its great affinity for oxygen, should be preserved in its metallic state in a mass of charcoal; which being admitted, its action on moisture may be explained by the following rationale:—

Hydrogen (possibly potassiuretted.)

Hygrometric moisture. { Oxygen / Hydrogen } { Carbon / Potassium } Charcoal.

Carbon and potash.

The moisture, when admitted to the potassium, becomes decomposed, its oxygen combining with that metal, while the hydrogen being liberated, continues ascending towards the surface until it reaches the influence of atmospheric pressure, where it is stopped so long as its elasticity is insufficient to overcome it, and escaping only, when, by accumulation and increase of temperature by chemical action, it

* See this Journal for November last.

has obtained sufficient force to do so, thus presenting at once a considerable body of gas to the action of the oxygen contained in the atmosphere. In this opinion, I cannot but consider myself as being fully borne out by the results of Mr. Hadfield's and Colonel Aubert's experiments.

Mr. Hadfield's first two experiments show, that old charcoal which had been long exposed to the action of a damp atmosphere did not rise to so high a temperature as new, which, on the above assumption, could not possibly be otherwise, for a portion of the potassium having already become oxidated, the remainder could not be capable of causing so great an action, by the decomposition of water, and liberation of its heat, as that which has not undergone a change.

Combustion taking place generally near the surface—next to the wall when charcoal is placed against one—and reignition twenty-four hours after the fire had been extinguished by water; as well as long jets of fire proceeding from charcoal, on its being tilted from a cask, may all be adduced in support of my views, to which may be added that in Mr. Hadfield's experiments, which he performed with coarse charcoal, combustion generally took place six inches below the surface; whilst Colonel Aubert's charcoal, being considerably finer, took fire short of two inches of the surface.

If the above conclusions are correct, it will be no longer a matter of surprise, that a thermometer placed in a bad conductor of heat, (lead,) and surrounded by one of the very worst, (charcoal,) should be but slightly affected, while combustion was actually going on within six inches of it. [*Rep. Pat. Inv.*

Resistance of Fluids to Bodies passing through them.

The following notice has recently appeared of a paper entitled "An Account of a Second Series of Experiments on the Resistance of Fluids to Bodies passing through them;" by James Walker, Esq., F. R. S., Civil Engineer; which was read before the Royal Society, on June 6th, 1833.

The author, in a paper read to the Society in the year 1827, and printed in the Philosophical Transactions, gave an account of some experiments showing that the resistance of fluids increases in a ratio considerably higher than the square of the velocity, and that the absolute resistance is smaller than had been deduced from the experiments of the French Academy. In the present communication, he states the results of his further inquiries on this subject. His experiments were made at the East India Docks, on a boat twenty-three feet long and six wide, with the stem and stern nearly vertical; one end being terminated by an angle of forty-two degrees, and the other of seventy-two degrees; and the resistance to the boat's motion being measured by a dynamometer. The results are given in tables; and it appears from them that in light vessels sharpness is more important in the bow than in the stern; but that the reverse is the case in

vessels carrying heavy cargoes. From another series of experiments the author infers that the resistance to a flat surface does not exceed 1.25 lb. for each square foot, at a speed of one mile per hour; increasing for greater velocities, in a ratio considerably higher than the square of the velocity. The author concludes with some observations on the results lately obtained in Scotland, where great velocities were given to boats moving on canals, without a proportional increase of resistance.—*Proceedings of Royal Society.* [*Ibid.*

Decease of the Inventor of the Steam Press.

The German papers announce the death of Frederick Kœnig, on the 17th ultimo, at Oberzell, near Wurtsburg. He was the inventor of the mechanical presses, upon an entirely new principle, which he, in conjunction with his friend Bauer, of Wirtemburg, first brought into use for the *Times*, of London. The steam presses of the *Augsburg Gazette* were also constructed by them. For the last fourteen years they have had an extensive manufactory at Oberzell.

CELESTIAL PHENOMENA, FOR MAY, 1834.

Calculated by S. C. Walker.

D.	H.	M.						
5	21	23	☿	☌	☽	☿	North 2°.0	
9	12	31	♀	☌	☽	♀	North 2°.3	
17	7		♀	☌	ι Tauri	♀	North 1°.9	
18	6	57	♄	☌	☽	♃	South 2°.8	
23	13	45	☿	☌	♃	☿	South 4′.0	
10	7	5	Im.	(282)	Tauri	,7,	N114°	V165°
10	8	0	Em.				250°	303°
17	13	20	Im.		ν Virginis	,4. 5,	185°	237°
17	13	40	Em.				229°	282°
21	14	03	Im.	32	ζ^1 Libræ	,6,	118°	141°
21	15	17	Em.				300°	297°
21	16	00	N. App.		☽ 34 ζ^3 Libræ	,6,	☽ South 0′.3	
21	16	39	Im.	35	ζ^4 Libræ	,6,	154°	206°
21	17	23	Em.				240°	292°
22	9	7	Im.	(28)	Scorpii	,7,	151°	116°
22	9	35	Em.				225°	185°
25	12	37	Im.	(47)	χ Sagittarii	,6,	150°	128°
25	13	02	Em.				218°	193°
27	12	18	Im.	28	φ Capricorni	,6,	127°	265°
27	13	1	Em.				190°	219°

Cement for Glass and China.

Take an ounce of pure gum mastic, which dissolve in a sufficient quantity of alcohol. Soak 1 ounce of Icthyocolla, or fish glue, in water until it is soft, and dissolve it in alcohol; mix the two solutions together, and add to them one-fourth of an ounce of gum ammoniac; heat the whole until it is thoroughly incorporated, and pour the cement into a phial. When it is to be used, warm the phial, and also the article to be cemented. This cement dries quickly, and adheres firmly.

Meteorological Observations for February, 1834.

Moon.	Days.	Therm. Sunrise.	Therm. 2 P.M.	Barometer. Sun Rise.	Barometer. 2 P.M.	Wind. Direction.	Wind. Force.	Water fallen in rain.	State of the weather, and Remarks.
				Inches.	Inches.			Inches.	
☉	1	32°	34°	29.80	29.90	NE. E.	Blustering	0.53	Cloudy—rain.
	2	32	34	.80	30.00	W.	Moderate.		Clear day.
	3	32	44	30.13	.10	SW.	do.		Clear day.
	4	31	44	29.72	29.65	W.	do.		Clear—flying clouds
	5	32	49	.65	.65	W.	do.		Clear day.
	6	37	49	.70	.90	W.	do.		Clear day.
	7	33	32	.75	.90	E.	do.		Cloudy—flying clouds.
	8	30	33	30.10	30.10	E.	do.		Cloudy—lightly cloudy.
	9	32	33	29.85	29.75	S. E.	do.		Cloudy—rain.
	10	35	40	.80	.90	N. E.	do.	0.25	Cloudy day.
	11	35	48	.90	.85	W.	do.		Cloudy—flying clouds.
	12	30	38	30.10	30.15	NW.	do.		Clear—cloudy.
	13	32	30	.10	.10	W.	do.		Clear—flying clouds.
	14	34	50	29.80	29.75	S. W.	do.		Clear day.
	15	48	65	.60	.50	S. SW.	do.		Cloudy—flying clouds.
	16	45	49	.70	.90	NW.	Brisk.		
	17	38	40	30.10	30.30	E.	Moderate.		Cloudy day.
	18	39	45	.35	.40	NW. S.	do.		Cloudy day.
	19	33	54	.30	.10	SE.	do.	0.43	Clear day.
	20	43	56	29.90	29.95	W. SE.	Calm.		Cloudy—rain.
	21	33	54	.95	.90	S.	do.		Clear—hazy.
☾	22	44	51	.90	.90	SE.	do.		Clear day.
	23	49	53	.80	.65	SE. E.	do.		Cloudy day.
	24	43	49	.80	.50	W. SE.	Moderate.	0.47	Rain.
	25	40	43	.85	.65	SE.	do.		Cloudy—drizzle.
	26	36	45	.84	.90	W.	Blustering	0.30	Drizzle—cloudy.
	27	36	45	30.05	.90	W.	do.		Flying clouds—cloudy.
	28	31	47	29.70	.70	W.	do.		Clear—cloudy.
	Mean	34.57	44.11	29.89	29.88			1.98	

Thermometer.		Barometer.
Maximum height during the month,	65. on 15th.	30.40 on 18th.
Minimum do.	20. on 8th.	29.50 on 15th.
Mean do.	39.34	29.88